Journal of World Prehistory, Vol. 10, No. 3, 1996

The Archaic Prehistory of the North American Southwest

Bruce B. Huckell[1,2]

Evidence today suggests that by at least 8000 to 8500 B.P., Archaic hunter-gatherer economies were established throughout the North American Southwest. The Early Archaic seems to be a period of considerable variability across the subregions; this may be a product of currently slim knowledge of the period, or it may indicate that the region witnessed considerable flux. With the Middle Archaic period from 5500 to 3500 B.P. there seems to be greater similarity in material culture across the region and a definite increase in the number of known sites. Finally, the Late Archaic/Early Agricultural period from 3500 to 2000 or 1500 B.P. sees the establishment of a mixed farming-foraging economy in much of the Southwest with apparently major changes in subsistence-settlement systems. Preagricultural Archaic land use patterns are known in broad outline but not in detail; high mobility by small social groups in an annual round would have permitted exploitation of diverse biotic communities. In most parts of the region, significant socioeconomic change accompanies the incorporation of agriculture into the late preceramic period, as witnessed by the appearance of longer-term residential sites with pitstructures and storage features.

KEY WORDS: North American Southwest; Archaic; hunter-gatherers; subsistence-settlement systems.

INTRODUCTION

One archaeologist recently characterized Archaic prehistory as the "unknown archaeology of the Southwest" (Simmons, 1989). This is quite

[1]Maxwell Museum of Anthropology, University of New Mexico, Albuquerque, New Mexico 87131.
[2]To whom correspondence should be addressed.

apt, because although the Archaic period spans some 70 to 80 percent of the culture history of the North American Southwest, it has certainly not received an equivalent proportion of archaeological attention or interest. Many researchers tend to consider it a long, static prelude to the ceramic-producing Southwestern cultures of the Christian era.

As used in this article, "Archaic" refers to the post-Paleoindian, preceramic portion of North American Southwestern culture history. Somewhat confusingly, the term has served to designate both a time period and a way of life (Cordell 1984). In the latter sense, it refers to a socioeconomic adaptation—so-called broad spectrum hunting and gathering—that placed emphasis on plant seed resources with the hunting of small as well as large game animals. This contrasts with the preceding Paleoindian economies that relied on the hunting of large mammals to a greater degree and apparently did not exploit plant seeds. It is probable, as several authors have observed, that Paleoindians had more varied economies, and so the adaptive gulf between the two periods is not so wide or deep as we might think. Still, the appearance of ground stone seed milling equipment some 8000 to 8500 years ago is a convenient material marker of the rise of more generalized Archaic economies. What signifies the end of the Archaic period is an as yet unresolved issue. Traditionally, the appearance of pottery in the early centuries A.D. marks the end of the Archaic period for many Southwesternists, and the beginnings of the four principal cultural traditions of later prehistory: Anasazi, Mogollon, Hohokam, and Patayan. However, in recent years, data have accumulated that suggest substantial integration of agriculture into Southwestern foraging economies by some 3000 to 3500 years ago. Strict adherence to the socioeconomic definition of Archaic would suggest that the rise of mixed farming-foraging economies more appropriately represents the end of the Archaic period. For this overview the more liberal definition—from the appearance of ground stone seed-milling equipment to the appearance of ceramics—will be used to ensure the broadest coverage of the post-Paleoindian, preceramic record.

In recent years there have been a number of overviews of the Archaic period in the Southwest. Among the more detailed and geographically comprehensive are those by Matson (1991) and Berry and Berry (1986); more regionally limited ones include those of Vogler *et al.* (1993) and Vierra (1994a) for the San Juan Basin, Simmons (1989) for most of New Mexico, MacNeish and Beckett (1987) for south-central New Mexico and northern Chihuahua, Geib (1995) for the central Colorado Plateau, and Huckell (1984, 1995) for southern Arizona. Treatments of the incorporation of agriculture into Archaic foraging economies are also numerous (Berry, 1982, 1985; Minnis, 1985, 1992; Wills, 1988b, 1992, 1995; Matson, 1991; Wills and Huckell, 1994; Huckell, 1988, 1995; Smiley, 1994). My intent is to com-

plement and update rather than duplicate these works. The following pages present what is known about the Archaic period in this vast region that spans parts of two nations. Beginning with a brief description of the environment and a consideration of the history of Archaic period research and cultural-temporal systematics, the archaeological record for the period is broken into three temporal divisions and described. Efforts to reconstruct Archaic subsistence-settlement systems are traced, and priorities for future research are identified.

THE NORTH AMERICAN SOUTHWEST

What is encompassed by the Southwest? In traditional usage, it has served primarily to designate the southwestern United States, but the modern political boundary between Mexico and the United States does not coincide with any meaningful cultural divisions during the preceramic period. Linda Cordell (1984, p. 2) defined the Southwestern culture area as "extending from Durango, Mexico, to Durango, Colorado, and from Las Vegas, New Mexico, to Las Vegas, Nevada." Although recognizing the diverse linguistic and cultural composition of the native peoples of the area, she stated that the cultivation of maize, beans, and squash served to set the area apart from the foraging societies of the Great Basin and southeastern California and the bison-hunting cultures of the southern Great Plains. The position and nature of the southern boundary was, she noted, less certain but separated the Southwestern culture area from the more sociopolitically complex Mesoamerican core area. Northwestern Arizona, southwestern Utah, and southern Nevada lying north and northwest of the Colorado River are also considered part of the Great Basin culture area (D'Azevedo, 1986), but particularly for the Archaic period this region is frequently viewed as part of the Southwest (Berry and Berry, 1986; Matson, 1991). Cordell's boundaries, although drawn with the later prehistoric period in mind, serve to frame the spatial coverage of this overview. Because two sites with important implications for understanding the Southwest occur on it, the northern Colorado Plateau is considered as well.

"North American Southwest" is used to refer to this region. It has the advantage of a continental-scale geographic perspective and avoids undue emphasis on the political boundary dividing the region. Further, this geographically expansive definition affords an appropriate scale for consideration of the patterns of land use by mobile foragers in an arid setting. Figure 1 shows the North American Southwest as considered in this overview.

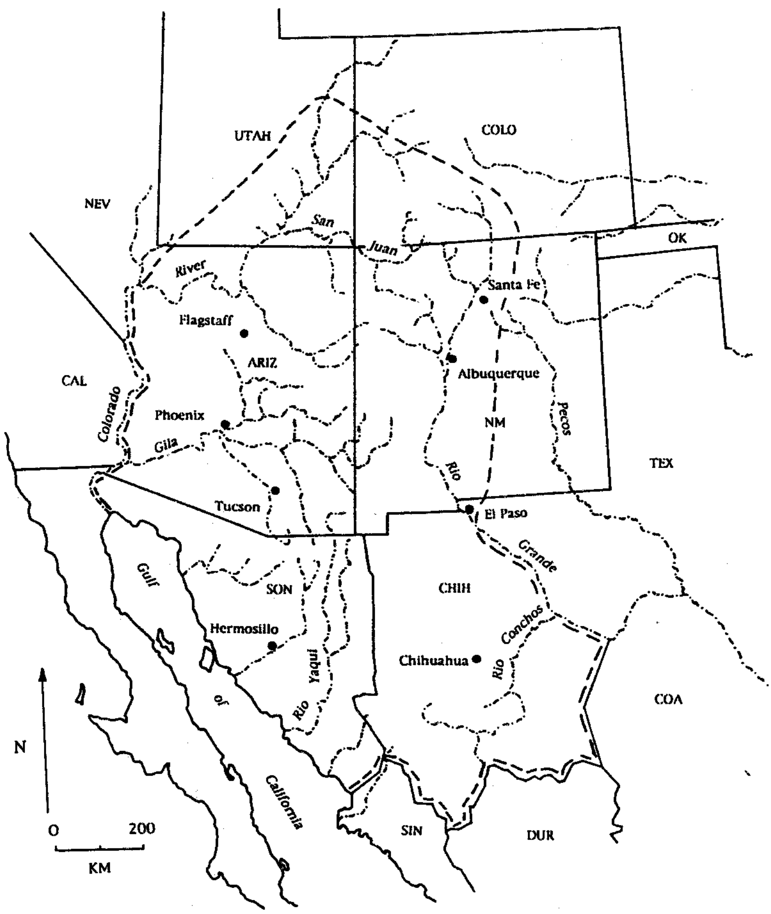

Fig. 1. Geographic limits (dashed lines) of the North American Southwest.

THE PRESENT NATURAL SETTING

Although it has long held a popular image as a desert, the North American Southwest actually contains tremendous environmental diversity. While it does indeed boast great expanses of arid and semiarid regions, it is broken by several permanent rivers and streams. And, despite the fact that some of it lies at or near sea level, parts of it are crowned with mountains that reach to more than 3000 m. In order better to appreciate it as the stage upon which Archaic prehistory played out, it is important to

briefly describe the region's environment and how it may have changed over the past 10,000 years.

Physiography

The North American Southwest can be partitioned into a series of provinces that are recognized by their distinctive landforms and geologic histories (Fig. 2). Of this series, the Southern Basin and Range and the

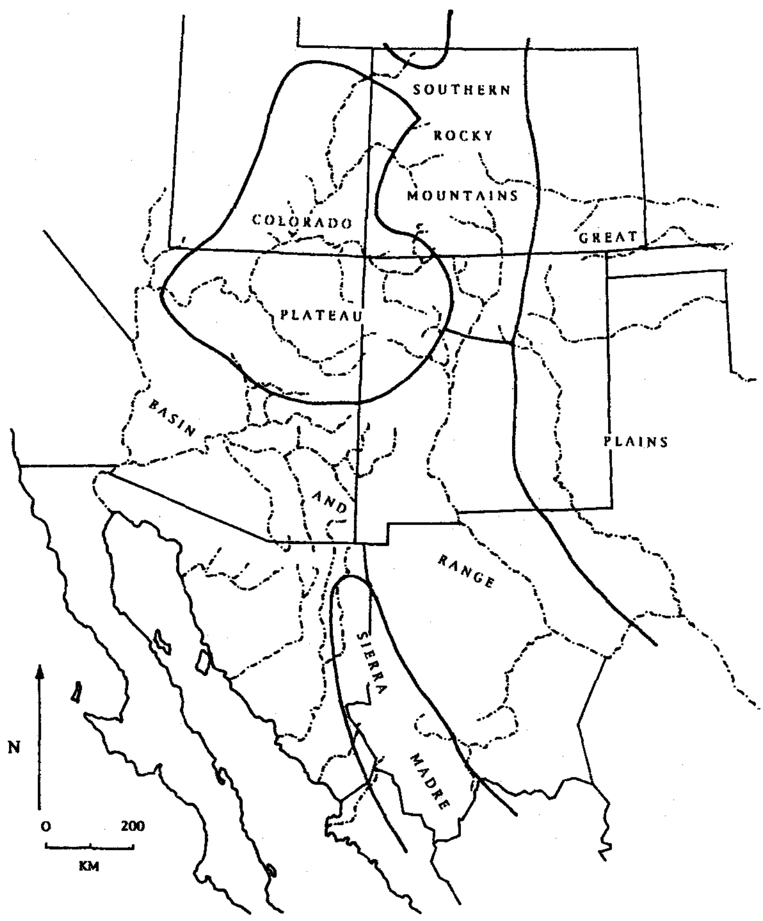

Fig. 2. Physiographic provinces of the North American Southwest.

Colorado Plateau account for some 75% of the region. Perhaps most familiar is the Southern Basin and Range Province that occupies the western one third of the area (Hunt, 1983; Schmidt, 1973; Alvarez P. *et al.,* 1985). It consists of broad alluvial basins bordered by north–south aligned mountain ranges. Elevations of the basins range from near sea level in the southwest to more than 1000 m in southeastern Arizona, and the elevations of the basin-bounding ranges extend from less than 200 m to more than 2000 m across the same transect.

The Colorado Plateau is a high platform, averaging 1500 m in elevation, relatively level but broken by occasional ranges of mountains and numerous canyons carved deeply into bedrock. It covers most of northern Arizona, southeastern Utah, southwestern Colorado, and northwestern New Mexico (Hunt, 1983). The Mogollon Rim separates the Southern Basin and Range Province from the Colorado Plateau. The Rim extends from northwestern Arizona southeastward into New Mexico and ranges from a relatively minor scarp to a zone of rugged, block-faulted, mountains and narrow basins. In the eastern half of Arizona and the western third of New Mexico, this zone is often called the Mogollon Highlands.

The southern and western margins of two other major physiographic provinces reach into the northeastern part of the North American Southwest. They are the Rocky Mountains, incorporating a series of separate ranges bordering the northern Rio Grande River region north of Albuquerque, and the Great Plains, a largely level, expansive shield extending from the mountain ranges that border the southern Rio Grande eastward across eastern New Mexico, southeastern Colorado, and into Texas.

In what is today northern Mexico, the Southern Basin and Range is divided into eastern and western sections by the rugged Sierra Madre Occidental Mountains. The political boundary between Sonora and Chihuahua follows the trend of the range. In places the Sierra Madre reaches elevations of 3000 m, and in addition to steep-sided, north–south aligned ridges and deep, narrow canyons, the heart of the range also contains stretches of broad plateaus.

The North American Southwest has few major perennial rivers. North of the present international boundary, the two largest are the Colorado and the Rio Grande. The larger tributary systems of the Colorado—notably the Gila and Salt, Little Colorado, and San Juan rivers—also have permanent flow along significant portions of their courses. The same is true for the Chama, San Jose, and Puerco rivers, all tributaries of the Rio Grande. The Colorado River ultimately drains more than two-thirds of the Southwest north of the present international boundary, the Rio Grande the remaining third. South of the border, Sonora has the Rio Yaqui and its several tributaries, as well as the Rio de Sonora and the Rio Magdalena.

Chihuahua has the Rio Conchos, Rio Casas Grandes, Rio del Carmen, and Rio Santa Maria, although only the Rio Conchos contributes its flow to a larger river, the Rio Grande (or Rio Bravo, as it is known to residents of Mexico).

Ephemeral drainages that carry runoff only in response to localized precipitation are abundant. Point sources of water, consisting of springs, tanks (*tinajas*), and rare lakes, are also scattered throughout the region. Particularly when they occur in areas where permanent stream flow is lacking, such water sources are of critical importance in human settlement, if only seasonally.

Climate

Climatically the North American Southwest is marked primarily, but not exclusively, by aridity. Nearly all of the region receives biseasonal precipitation, with rain falling today during winter and summer periods. Winter (November through May) rainfall is derived from large frontal systems originating from the Pacific Ocean and is of diminishing quantity and therefore importance proceeding from north to south across the region. Summer (June through September) precipitation is ultimately derived from the southeast (Gulf of Mexico) and southwest (Gulf of California), and its contribution to the annual total diminishes from south to north. Average annual precipitation may range from as little as 12 cm to as much as 90 cm. However, in common with arid lands everywhere, there is tremendous variation in the amount received in a given season or year, and an abnormally wet season or year can be followed by an abnormally dry one. Extremes in temperature, ranging from well below 0°C in the winter and above 40°C in the summer, are common throughout the region as well.

Biota

The plant and animal life that can be found today in the North American Southwest is remarkably diverse and reflects the climatic conditions outlined above. Figure 3 portrays some of this diversity by dividing the region into biogeographic or biotic provinces, following Lowe and Brown (1982). These provinces are defined primarily on the basis of natural vegetation, and each contains a number of discrete biotic communities. Detailed descriptions are given by Brown (1982a), Schmidt (1973), and Alvarez P. *et al.* (1985). One critical aspect of the North American Southwestern biotic environment that is not apparent from Fig. 3 is the importance of water, elevation, slope, aspect, and pedology on the distribution of plants and ani-

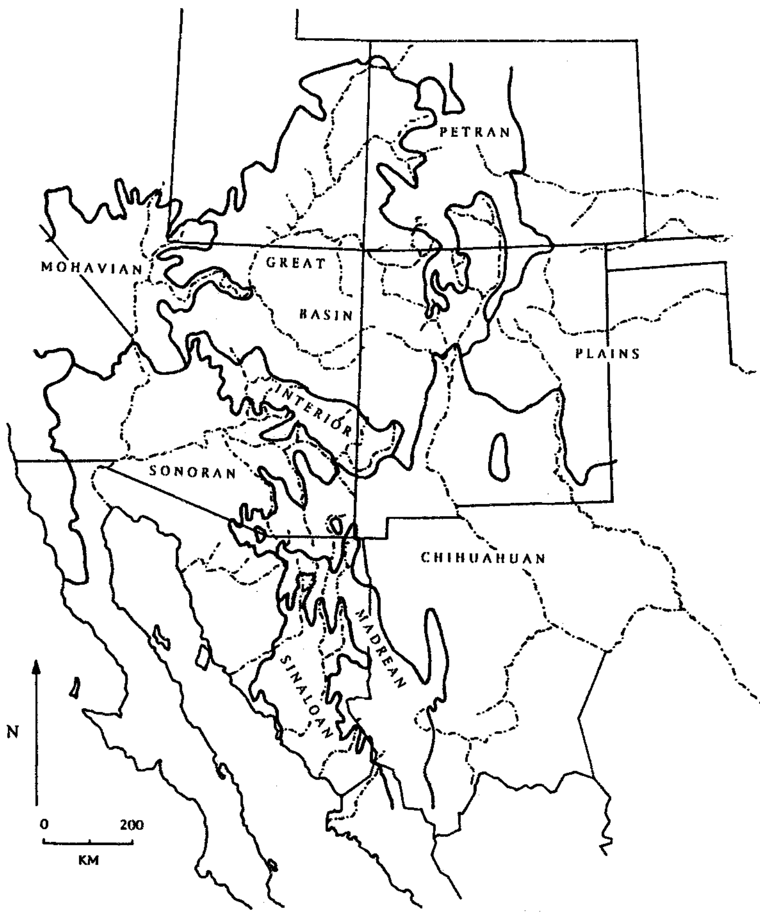

Fig. 3. Biotic provinces of the North American Southwest.

mals. This variation creates a rich, complex mosaic of communities and associations across the landscape.

As Fig. 3 shows, most of the North American Southwest is covered by three biotic provinces: Sonoran, Great Basin, and Chihuahuan. Along with a minor part of a fourth province, Mohavian, these closely correspond to the arid-semiarid, desert portions of the Southern Basin and Range and the Colorado Plateau. The Sonoran, Chihuahuan, Great Basin, and Mohavian biotic provinces are primarily shrub-dominated deserts. Both the Sonoran Desertscrub and the Chihuahuan Desertscrub are typified by

cresotebush (*Larrea tridentata*) and also contain cacti (cholla (*Opuntia* spp.), prickly pear (*Opuntia*, spp.), saguaro (*Carnegiea*), organ pipe (*Lemaireocereus*)) and leguminous trees and shrubs such as mesquite (*Prosopis* spp.), paloverde (*Cercidium* spp.), catclaw and other *Acacia* species, and ironwood (*Olneya tesota*). These biotic provinces are punctuated by mountain ranges, which, depending upon their elevations, may offer more mesic biotic communities; many do not. The Chihuahuan Desertscrub is more impoverished with regard to trees and lacks the giant columnar cacti (saguaro and organ pipe). A second biotic community, the semidesert grassland, borders the desertscrub in slightly higher elevations (above 1100 m) at the margins of these provinces. In addition to desertscrub plants, it offers several species of grass and such succulents as yucca (*Yucca* spp.) and agave (*Agave* spp.)

The Great Basin biotic province occupies the Colorado Plateau. It consists primarily of the Great Basin Desertscrub biotic community, a shrub desert of sagebrush (*Artemesia* spp), blackbrush (*Coleogyne*), and shadscale (*Atriplex*), but also has grassland and xeric woodland communities of juniper (*Juniperus* spp.) and pinyon (*Pinus monophylla, P. edulis, P. cembroides*). The Mohavian biotic province is between and transitional from the Great Basin to the Sonoran provinces. Found in a small area of the northwestern part of the North American Southwest, it contains many plant species common in the two bordering provinces.

The Interior or Arizonan biotic province is found in the rugged Mogollon Rim country. Principally, it consists of the Interior Chaparral biotic community, a dense, shrub-dominated community containing brushy thickets of manzanita (*Arctostaphylos* spp.), scrub oak (*Quercus turbinella*), and other woody shrubs. At higher elevations in the Mogollon Highlands, juniper and pinyon forests are present, and higher still one finds ponderosa pine (*Pinus ponderosa*) forests and mixed conifer forests of pine (*Pinus flexilis, P. engelmannii*), fir (*Pseudotsuga, Abies*), aspen (*Populus*), and spruce (*Picea*).

Two montane biotic provinces, Petran and Madrean, are respectively associated with the Rocky Mountains and the Sierra Madre Mountains. In general, these provinces extend no lower than 1000–1200 m and may reach as high as 3000 m. The Petran biotic province is only slightly represented in the north–central part of New Mexico and by a disjunct outlier in south–central New Mexico. It consists primarily of Rocky Mountain (Petran) Subalpine Conifer Forest but also contains mixed conifers and alpine tundra vegetation.

The Madrean biotic province is found primarily in northern Mexico but extends into southeastern Arizona and the bootheel of southwestern New Mexico. It contains the evergreen oak (*Quercus* spp.)-dominated woodland, the Mexican oak-pine woodland, and, still higher, the Madrean Montane Conifer Forest.

Two other provinces only slightly touch the North American Southwest: the Sinaloan biotic province, a tropical shrubland and thornforest found in east-central Sonora, and the extensive tall-, mixed-, and short-grass Plains Grassland biotic province of eastern New Mexico.

Not specifically identified in Fig. 3 are the riparian communities that can be found along nearly all of the watercourses. Such communities range from more xeric associations of leguminous trees along ephemeral washes to well-developed cottonwood (*Populus* spp.)-willow (*Salix* spp.) gallery forests along perennial streams and rivers. Marsh communities (*vegas* or *cienegas*) occur along streams from lower elevations in the deserts to high mountain meadows.

Many species of mammals crosscut these provinces. Large mammals include mule deer (*Odocoileus hemionus*), white-tailed deer (*O. virginianus*), pronghorn antelope (*Antilocapra americana*), bighorn sheep (*Ovis canadensis*), elk or wapiti (*Cervus canadensis*), and (formerly in some areas) bison (*Bison bison*). Small mammals, including cottontail (*Sylvilagus* spp.) and jack (*Lepus* spp.) rabbits, are abundant in all provinces.

It is important to recognize that the present biotic environment has been modified by three centuries of Euro-American settlement and land use practices including the introduction of Old World grazing animals, timber and fuelwood harvesting, irrigation agriculture, fire suppression, and mining (Hastings and Turner, 1965; Humphrey, 1987; Bahre, 1990).

RESOURCES AND HUNTER-GATHERERS

Despite the impacts of historic land use practices, the modern biotic communities and climatic regime offer important insights into basic resource structure and distribution and are therefore important for understanding Archaic land use practices. Four key aspects of resource structure and distribution are redundancy, seasonality, variability, and accessibility. *Redundancy*, or low diversity in plant communities, is common to a great deal of the North American Southwest, including much of the desertscrub in the Great Basin, Chihuahuan, and part of the Sonoran biotic provinces. Vast areas of each show the same few dominant perennial plants, and these are often not valuable as human dietary staples (creosotebush, sagebrush, blackbrush, etc.). Scattered perennial or annual grasses and ephemerals may be present but in quantities too small to support forager settlements in any one place for very long. A low variety and abundance of animals often reflects the composition of the flora. Riparian communities within these biotic provinces may offer not only higher diversity but greater numbers of economically important plants and, of course, water. They often

assume a level of importance in structuring human foraging and settlement far out of proportion to their actual areas. Higher diversity biotic communities, generally those at and just above the upper margin of the desertscrub and below the ponderosa pine forests, typically contain more species of value to humans as well as higher densities of those species.

Seasonality is another key feature that structures use of the region. The biseasonal precipitation regime produces two periods of resource abundance, each characterized by both annual and perennial plants that produce edible greens, fruits, or seeds that are available for periods of a few weeks. Knowledge of the time of year when particular plant resources can be harvested, and of course their locations, exerts a strong influence on patterns of movement of hunter-gatherers. The predictability of this seasonal rhythm of production is a primary factor in structuring the annual round of mobility.

Variability is another critical aspect of the North American Southwest. As precipitation, humidity, and temperature vary from season to season and year to year, so too does the productivity of plants and the animals that depend on them. Excellent growing conditions in one season may produce a tremendous surfeit of resources, while poor conditions—perhaps in the following season or the following year—may result in exactly the opposite condition. In particular, the productivity of annual plants is closely tied to seasonal precipitation, and the variability in productivity may be as much as 150% of the variability in precipitation (Le Houerou *et al.*, 1988). The behavior of perennial plants is less closely tied to seasonal precipitation, but multiseason droughts or wet periods reduce or enhance production of edible products. The duration and recurrence of droughts and wet periods are unpredictable in the absence of sophisticated knowledge of climatology.

Finally, resource *accessibility* plays an important role in understanding how human foragers exploit the North American Southwest. For example, high topographic relief permits the vertical "stacking" of biotic communities in the higher mountains of the Southern Basin and Range Province and the Mogollon Rim that are bordered by desertscrub in the basins. Such situations stand in contrast to the redundancy described above, permitting relatively easy access to the resources of several biotic communities arrayed along an elevational gradient over a comparatively short horizontal space.

LATE QUATERNARY PALEOENVIRONMENTS

The modern Southwestern biotic communities are the product of the last 4000 years or so of the modern climatic regime, so study of Archaic

foragers living prior to 4000 B.P. necessitates understanding of past environmental conditions. Study of Holocene paleoenvironments has relied on Quaternary geological studies (Antevs, 1941, 1955, 1983; Haynes, 1987; Waters, 1989), palynological research (Martin, 1963; Irwin-Williams and Haynes, 1970; Hall, 1985), and, increasingly over the last two decades, the analysis of fossil packrat nests (Betancourt *et al.*, 1990). Such efforts are aided by climatic modeling—based on earth's atmospheric dynamics, orbital parameters, solar energy input, and other variables—that produces "snapshots" of conditions at 3000 year intervals through the late Quaternary (Kutzbach, 1987; COHMAP Members, 1988; Kutzbach *et al.*, 1993) . Thompson *et al.* (1993) have recently summarized and compared empirical and climatic modeling data to reconstruct late Quaternary environments in the western United States. The Holocene is divided into early, middle, and late segments, with varying date ranges for each among researchers.

The Early Holocene

The early Holocene, from approximately 11,000 to 8900 or 8000 B.P., is best viewed as transitional between late Wisconsin conditions and the warmer middle Holocene. Rapid deglaciation, climatic warming, and shifts in atmospheric circulation patterns led to the demise of winter-dominant precipitation and the plant communities that thrived under such a regime (Thompson *et al.*, 1993). In the North American Southwest, some more xeric elements of late Wisconsin vegetation persisted in many areas of what is presently Sonoran, Chihuahuan, and Mohavian desertscrub. Packrat midden data show that typical desertscrub species (brittlebush, creosotebush, mesquite, cholla, saguaro) became prominent elements of communites alongside juniper and scrub oak in low-elevation mountains. On the Colorado Plateau, montane conifers persisted at elevations lower than at present and often included species no longer found in the Southwest. The establishment of significant summer rainfall is evidenced by the appearance of summer obligate species in the Sonoran and Chihuahuan deserts and by the expansion of ponderosa pine and Gambel oak well to the north of their present distribution on the Colorado Plateau (Betancourt, 1990; Van Devender, 1990a, 1990b). Certain conifers such as pinyon pine moved north from late Wisconsin refugia at lower elevations and lower latitudes. Closed basins such as the Willcox Playa of southeastern Arizona (Waters, 1989) and San Agustin Plains in west central New Mexico (Markgraf *et al.*, 1984) both supported lakes during this period.

The general circulation climatic model of Kutzbach *et al.* (1993) and empirical data both support the existence of greater effective precipitation

for the North American Southwest during this interval than today, despite clear evidence of climatic warming (Thompson *et al.*, 1993). The model predicts greater summer and lesser winter insolation values at 9000 B.P. than at present. In fact, it seems that maximum effective precipitation for the entire Southwest and Great Basin occurred close to 9000 B.P. (Thompson *et al.*, 1993: Figs. 18.13 and 18.14), as strong summer monsoonal circulation developed and brought moisture into the region from the Pacific Ocean and Gulf of Mexico.

The Middle Holocene

For study of the Archaic period, understanding the middle Holocene (ca. 8900 or 8000 to 4000 B.P.) paleoenvironment is critical; however, it remains the subject of controversy despite several decades of research. Antevs (1955) identified most of this interval (7000 to 4500 B.P.) as the Altithermal, a period of heightened aridity characterized by greater temperatures and less effective precipitation than at present. Lake desiccation, stream entrenchment, aeolian erosion, and soil formation were all used by Antevs to support his hot-dry characterization of the middle Holocene. As reviewed by Grayson (1993), Antevs developed this concept primarily in the Great Basin and the Southwest. However, Martin (1963) used palynological data from southeastern Arizona and arguments based on the atmospheric circulation patterns typical of the modern North American Southwest to suggest that at least part of the period was warmer but wetter, with increased summer precipitation. Although the data he used to advance this proposition were subsequently discredited (Mehringer, 1967), the theoretical basis—increased solar radiation promoting intensified development of monsoonal circulation of moisture into the North American Southwest—has remained viable. Moreover, the development of general circulation models has supported Martin's ideas.

More recent empirical work has demonstrated that the nature of middle Holocene environmental conditions varied greatly with both time and space across western North America. Evidence for heightened aridity for some or all of the period between 7500 or 8000 and 4000 B.P. has been offered from palynological studies within the Southwest (summarized by Hall, 1985), alluvial cut and fill events in southeastern Arizona (Waters, 1986a; Haynes, 1987), lake desiccation in southeastern Arizona (Waters, 1989), aeolian deposition and soil formation in eastern New Mexico and western Texas (Holliday, 1989; Monger, 1995), and Mohave Desert packrat middens (Spaulding, 1991).

Other empirical data, primarily from packrat middens, suggest that the middle Holocene was warmer and wetter during the summer but probably cooler and perhaps drier during the winter. Middle Holocene packrat middens from the Sonoran and Chihuahuan deserts indicate floras similar to those of today but lacking frost-sensitive subtropical species (Van Devender, 1990a, b). Van Devender (1990a) reported that middle Holocene packrat middens in the Sonoran Desert also reflect different species composition and greater species richness than at present. On the Colorado Plateau lower than modern elevational ranges for montane conifers and the continued existence of ponderosa pine and Gambel oak north of their modern ranges support more mesic conditions (Betancourt, 1990). An apparent high lake stand from 10,000 to around 6000 B.P. in the San Agustin Plains of west-central New Mexico further supports a warm-wet climate (Markgraf *et al.,* 1984). The Willcox Playa was apparently dry between 8900 and 5500 B.P. but a resurgence of lacustrine activity occurred between 5500 and 3000 to 4000 B.P. (Waters, 1989).

The general circulation model of Kutzbach *et al.* (1993) suggests continued higher than present levels of summer insolation at 6000 B.P., though diminished from 9000 B.P., and continued lower than present levels of winter insolation. Monsoonal circulation, though still stronger than at present, was reduced from 9000 B.P. However, Thompson *et al.* (1993, Fig. 18.14) posit that increased summer precipitation was characteristic only of the southern portion of the Southwest; for the Colorado Plateau their data suggest that 6000 B.P. was the time of minimum effective precipitation during the entire Holocene. Therefore, it seems likely that in the Southwest, increased summer precipitation was present in the middle Holocene, but the northward and westward penetration of monsoonal circulation was diminshed.

The Late Holocene

After approximately 4000 B.P., Southwestern environmental conditions essentially like those of the present were established. Packrat middens contain almost exclusively locally extant taxa in assemblages that mirror current or historically known communities. Climatic models suggest that values for insolation and precipitation at 4000 B.P. differ only slightly from modern conditions. Thompson *et al.* (1993) have suggested that for the southern part of the Southwest, effective precipitation has been at its lowest during the late Holocene. Dean *et al.* (1985) used tree-ring records to demonstrate that over the last 1500 years there has been considerable climatic variation on the Colorado Plateau, but no major trends indicative of actual climatic change. Their assessment of the nature and frequency of variability is prob-

ably appropriate as a means of viewing the fluctuating nature of environmental conditions for the past 4000 years.

Implications for Human Paleoecology

Past environmental conditions clearly have important implications for understanding how Archaic hunter-gatherers may have utilized the North American Southwest. One of the most important considerations is that present-day biotic communities are probably poor indicators of the composition and position of pre-4000 B.P. communities. Packrat midden studies clearly demonstrate that past environmental change was not simply a matter of compositionally stable plant communities moving to higher or lower elevations with shifts in temperature and precipitation but, instead, the movement of particular species in response to such climatic changes. Early and middle Holocene communities frequently consisted of combinations of species that were not present earlier in time or in the more recent past. Such communities lack precise modern analogues and therefore reconstruction of them may be critically important for efforts to understand patterns of resource diversity, seasonality, variability, and accessibility that confronted Archaic foragers. Finally, use of "Altithermal" at least oversimplifies and probably misrepresents middle Holocene climate in the Southwest.

A HISTORY OF ARCHAIC PERIOD RESEARCH

General acceptance and use of the term "Archaic" has occurred only over the last 25 years and follows more than half a century that witnessed the definition of numerous "cultures," "traditions," and "complexes" that were applied to artifact assemblages believed to occupy varying but usually limited geographic spaces and periods of time. Table I presents a listing of the cultural entities that have been described for the Archaic period North American Southwest, presented more or less in the chronological order in which they were defined from 1930 to 1990.

Discovering the Archaic Period

The first preceramic culture was discovered before the turn of the century on the Colorado Plateau. It came to be known as Basket-Maker (now Basketmaker II) and was recognized as a prepottery, incipient farming culture ancestral to the later Pueblo groups. By the time A. V. Kidder wrote his seminal book *Southwestern Archaeology* in 1924, he speculated that a

Table I. Archaic Cultural Complexes, North American Southwest

Name	Source	Area
Gypsum complex	Harrington, 1933	SE Calif., Ariz., Great Basin
Pinto culture	Campbell and Campbell, 1935	SE Calif., Ariz., Great Basin
Lake Mohave culture	Campbell *et al.*, 1937	SE Calif., S. Great Basin
Pinto-Gypsum complex	Rogers, 1939	SE Calif., S. Great Basin
Playa industry or San Dieguito-Playa	Rogers, 1939; Warren, 1967	SE Calif., W Ariz., N Baja, S Great Basin
Amargosa industry	Rogers, 1939, 1958, 1966; Haury, 1950; Hayden, 1967, 1976	SE Calif., S Arix., Great Basin, N Sonora
Cochise culture	Sayles and Antevs, 1941; Sayles, 1983	S. Ariz., SW New Mex., N Sonora
Rio Grande complex	Renaud, 1942; Honea, 1969	N New Mex., S Colo.
San Jose complex	Bryan and Toulouse, 1943: Agogino and Hester, 1956; Mohr and Sample, 1959	NW New Mex., SE Utah
Lobo complex	Bryan and Toulouse, 1943; Agogino and Hester, 1956; Mohr and Sample, 1959	NW New Mex., SE Utah
Concho complex	Wendorf and Thomas, 1951	NE Ariz.
Atrisco focus	Campbell and Ellis, 1952	C New Mex.
Desert culture	Jennings, 1956, 1957, 1973	Great Basin, Southwest
Gallegos culture	Sample and Mohr, 1960	NW New Mex.
Moab complex	Hunt and Tanner, 1960	SE Utah
La Sal complex	Hunt and Tanner, 1960	SE Utah
Uncompahgre complex	Hunt and Tanner, 1960	SE Utah
Peralta complex	Fay, 1967	N Sonora
Picosa	Irwin-Williams, 1967	Southwest
Desha complex	Lindsay *et al.*, 1968	SE Utah, NE Ariz.
Southwestern Archaic	Irwin-Williams, 1968a	Southwest
Oshara tradition	Irwin-Williams, 1973, 1979	N Southwest
Chihuahua tradition	MacNeish and Beckett, 1987; MacNeish, 1993	SC New Mex. N Chihuahua

still earlier, purely hunting-gathering stage must have existed. In 1927 this hypothesized developmental stage was designated Basket-Maker I (Kidder, 1927).

By the mid-1930s, it had become apparent that human antiquity in the New World was considerably greater than had been appreciated. The discovery of Folsom and other Paleoindian cultures (Figgins, 1927; Roberts, 1935; Howard, 1935) established the presence of humans with extinct animals in the Southwest at the close of the Pleistocene some 10,000 years ago. Too, the perfection of tree-ring dating demonstrated that the Southwestern Pueblo cultures were much younger than initially believed, dating only a millennium or less before present. This effectively made Basket-

Maker I a stage several thousand years in duration, an unacceptable time span in relation to the rest of the Basketmaker-Pueblo prehistory.

By World War II several cultural complexes had been defined that met Kidder's criteria for pre-Basketmaker II hunter-gatherers and that were believed to fill some or all of this post-Paleoindian, pre-Basketmaker II temporal gap. Principal among them were the Cochise Culture (Sayles and Antevs, 1941; Sayles, 1983) in southeastern Arizona, Pinto Basin and Lake Mohave (Campbell and Campbell, 1935; Campbell et al., 1937) in southeastern California, Gypsum Cave (Harrington, 1933) in Nevada and southeastern California, and Malpais, Playa (Playa-San Dieguito), Pinto-Gypsum, and Amargosa (Rogers, 1939; see Warren, 1967 for a history of taxonomic changes) in southeastern California and western Arizona. *The Cochise Culture* was a landmark study. It was the first sustained Southwestern research effort devoted specifically to understanding the preceramic period. Second, it was the first significant collaboration of archaeologists, geologists, paleontologists, and other scientists to solve questions about ancient humans and their environments in the region. Finally, it was the first study to suggest that a uniform preceramic culture occupied a great portion of the North American Southwest for thousands of years.

In the northern Southwest a host of preceramic "complexes" was defined after World War II (Table I). Most were poorly dated, and of geographically limited extent, and, in retrospect, most were based on small samples from surface sites spanning several millennia. With few exceptions, these have passed into obscurity or been subsumed by more comprehensive formulations.

Recognition of preceramic sites in northern Mexico came relatively later, and it was not until the 1950s that information on any Archaic manifestations reached the published literature. Overviews of the preceramic of Mexico (MacNeish, 1964; Johnson, 1966; MacNeish and Turner, 1983; Phillips, 1989) identified few investigated sites in either Sonora or Chihuahua. Marrs (1949) described surface preceramic sites in southern Chihuahua, and excavation of cave sites in the northeastern Sierra Madre range by Lister (1958) disclosed preceramic occupations of uncertain cultural affiliation. Fay (1967), Johnson (1963), and Sayles (1983) reported Sonoran sites with materials likened to San Pedro Cochise. Hayden (1967, 1976) recognized San Dieguito and Amargosa complex materials in the Pinacate volcanic field of northwestern Sonora.

Those cultural entities that remain in use to varying degrees form a group of subregional "complexes," "traditions," or "cultures" that span large areas of the Southwest and most if not all of the temporal range of the Archaic period. These include the Cochise Culture (southeastern Arizona, southwestern New Mexico, northern Sonora), the Oshara Tradition

(Irwin-Williams, 1973, 1979) (northwestern New Mexico, southwestern Colorado, southeastern Utah, northeastern Arizona), the recently described Chihuahua Tradition (MacNeish and Beckett, 1987; MacNeish, 1993) (south-central New Mexico, northern Chihuahua), and the San Dieguito-Amargosa tradition (Rogers, 1966; Warren, 1984) (western Arizona, northwestern Sonora). All have received well-founded criticism concerning the adequacy of their formulation or suitability for representing the Archaic prehistory of a particular region (Huckell, 1984; Berry and Berry, 1986; Wills, 1988a; Matson, 1991). Most are recognized by distinctive artifact assemblages, although in practice it is projectile points that serve as the primary cultural and temporal diagnostic elements.

Broader Views of the Archaic

The 1950s and 1960s saw a general shift toward more areally inclusive views of preceramic culture. This trend was stimulated in large part by the work of Jennings (1956, 1957) in the Great Basin, and his development of the Desert Culture concept. Jennings viewed the Desert Culture to have at least three subregional manifestations, one of which was the Cochise Culture. He also recognized the Amargosa, Concho, San Jose, and other nonceramic complexes along the upper and middle Rio Grande as typical Desert Cultures. Kelley (1959) promoted a slightly broader view, referring to what he termed the "Desert cultures" that occupied not only the Southwest but covered the western United States. The Desert Culture gained some acceptance and use in the Southwest (MacGregor, 1965, pp. 124–131; Willey, 1966, pp. 55–60; Martin and Plog, 1973, pp. 69–80).

Another attempt to view southwestern North America from a regional perspective was that of Cynthia Irwin-Williams, who proposed the existence of what she termed Picosa. Picosa—an acronym derived from Pinto Basin, Cochise, and San Jose—designated "a continuum of similar closely related preceramic cultures existing in the southwestern United States during the last three millennia before Christ" (Irwin-Williams, 1967, p. 441). She documented both temporal and spatial variability within Picosa. Based on projectile point stylistic attributes, early and late manifestations of Picosa were identified, as were geographically based southern, western, and northern sectors, each characterized by distinctive projectile points during the early and late periods.

Irwin-Williams also pointed out that in attempting to characterize preceramic cultures, two separate conceptual scales should be envisioned: Level 1 or integrative analysis to identify fundamental, widespread traits and patterns, and Level 2, or isolative analysis to differentiate particular,

culture-historical sequences. While sharing "many elements of economy and orientation" with the Desert Culture and thus certainly similar at the integrative level, Irwin-Williams argued that Southwestern preceramic cultures should be distinguished from the Desert Culture on the basis of material inventory and culture history.

Although Picosa never caught on, use of the more general notion of the Archaic period did (Byers 1959; Willey and Phillips 1958). At the same time that Jennings was formulating the Desert Culture in the early 1950s, there was an active debate centered in the eastern half of the United States regarding post-Pleistocene preceramic prehistory and the merits of what was termed the Archaic stage. By the end of the 1950s, "Archaic" had come to be commonly used in the East, and it was generally recognized that the southwestern Desert Culture was "the cultural and temporal equivalent of the eastern Archaic" (Kelley, 1959). In the Southwest the term "Archaic" seems first to have been used by Irwin-Williams (1968a, b) when she referred to the "Southwestern Archaic" as a distinctive entity. By 1980 "Archaic" had largely supplanted Desert Culture in the Southwestern literature (Chapman, 1980).

How is the Archaic period of the Southwest perceived today? There is general agreement that the "Southwestern Archaic" is a recognizable entity at the regional level, but the use of subregional cultural designations continues. Figure 4 shows how the Archaic period has been partitioned at both levels. Each of the schemes for the region as a whole differs in the number of subdivisions, their chronological limits, and their labeling. Subregional cultural entities display similar divergence. It is not surprising that no one approach has been universally adopted, in part because control over chronology is so poor for so long a period and so vast an area. Moreover, individual researchers' assessments of similarity and difference, and their weighting of criteria to judge similarity and difference, ensure divergent schemes. It is perhaps best to remember that the value of all such cultural-temporal schemes is to help us organize our thinking and that variation is healthy. For the purpose of this overview, a three-part system is used: Early Archaic (8500 B.P. to 5500 B.P), Middle Archaic (5500 to 3500 B.P.), and Late Archaic/Early Agricultural period (3500 B.P. to 2000 B.P.).

ARCHAIC PREHISTORY: CAUTIONARY NOTES

Before describing the Archaic record in the North American Southwest, it is necessary to consider the empirical basis of that record. Two aspects of that record constrain our knowledge: the nature of Archaic sites

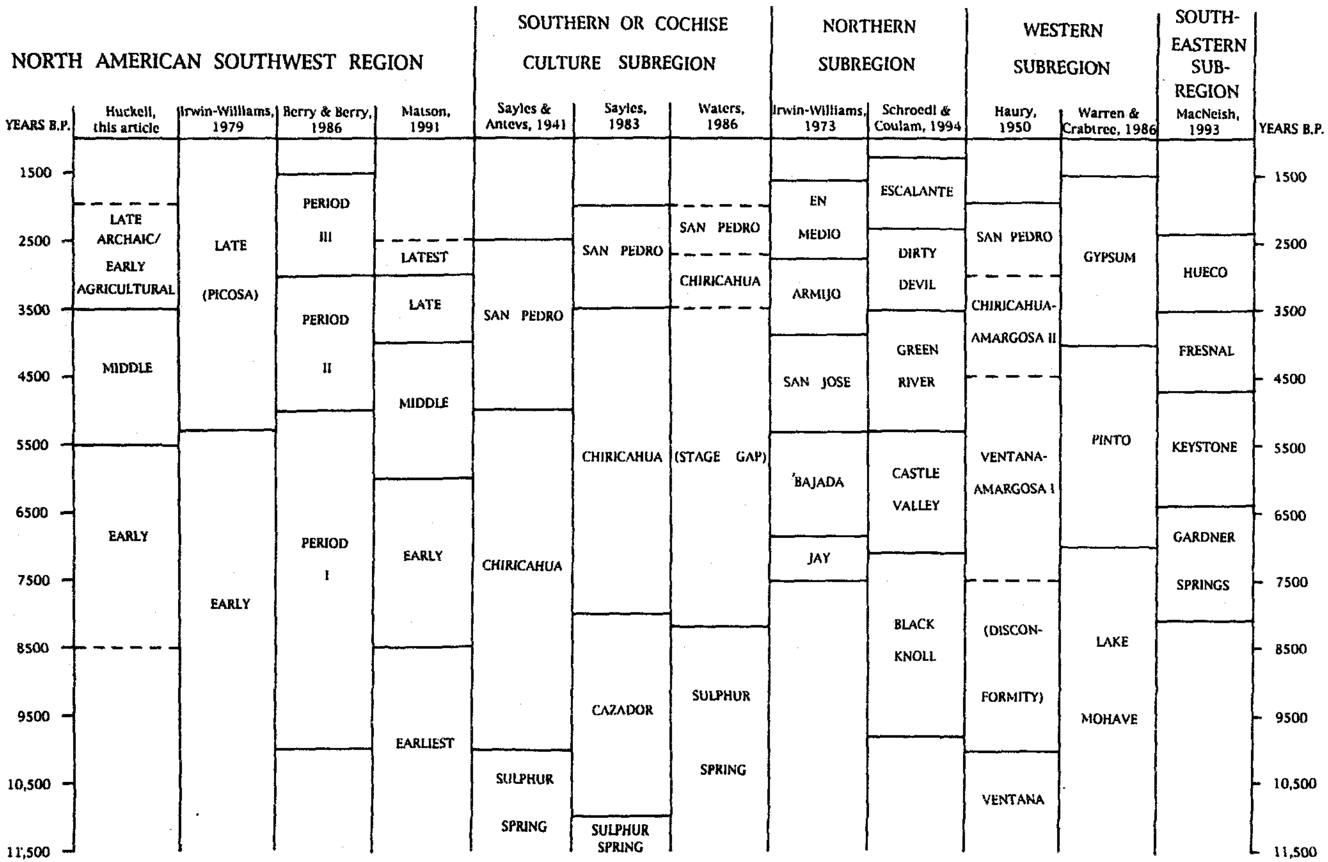

Fig. 4. Cultural, systematic, and chronometric divisions for the North American Southwest and its four principal subregions.

and depositional contexts and the interpretation of projectile point stylistic variation.

Depositional Contexts and Data Quality

For most of the region, knowledge about the Archaic period is disproportionately derived from surface and shallowly buried sites. As noted above, investigators prior to 1960 routinely described cultural complexes and projectile point types from surface collections. Some of these sites may cover thousands of square meters and yield impressive quantities of artifacts. However, it is clear that many represent multicomponent occupations mixed and exposed by postoccupational geomorphic processes or that occurred on landforms where rapid burial was not possible. Many probably span several thousand years, often because a predictable water source or other feature consistently attracted people to the same location. Unless stratified deposits are present, it may only be possible to assign a site to the Archaic period in general, and next to impossible to determine whether the same kind of redundant use of resources occurred over the many reoccupations, or whether the record is a complex mixture reflective of changing socioeconomic organization and site use over time. Even if shallowly buried features and deposits are discovered, preservation of organic materials—charcoal, macrobotanical remains, animal bones, and pollen—is often poor, thereby limiting information about diet and chronological position to inferences drawn from stone tools.

Eolian depositional contexts have the potential to yield Archaic sites of the type just described, but may also contain relatively intact, buried sites with good preservation of features and organic remains. Sand dunes in the northern part of the region in particular have produced excellent single-component occupations. The vagaries of eolian processes can make dunes a source of great information or great frustration for Archaic prehistorians.

Archaic sites may also be exposed in vertical-walled arroyos under 1 to 6 m of alluvium; such sites were instrumental in the definition of the Cochise Culture. These buried sites frequently contain intact features and preserved organic materials; their positions in alluvial contexts also reduces concerns about multicomponency. However, they are also difficult to excavate by virtue of their deep burial, which often limits the size of the exposure possible through excavation. Consequently, small, potentially nonrepresentative samples may result.

Another concern is that some sites may be localities where specialized hunting or gathering tasks occurred. For example, the absence of ground

stone milling equipment at some sites or projectile points at others has less to do with "culture" than with subsistence-settlement systems. Archaic sites small in area, low in artifact quantities, and lacking culturally or temporally diagnostic artifacts often cannot be accurately identified as to age or affinity. Thus, for many areas, "nonceramic" lithic artifact scatters that may represent either Archaic or younger ceramic period occupations are common.

By comparison to these surface and buried open sites, Archaic occupations in caves can be virtual gold mines. In the southern part of the region, Ventana Cave (Haury 1950) yielded a long occupational sequence, but unfortunately the deposits containing the Archaic occupation were moist, so preservation was poor. MacNeish (1993) and his colleagues have recently excavated a series of small shelters near El Paso. Two rockshelters on the northern Colorado Plateau, Cowboy Cave and Sudden Shelter, are key sites with long records and excellent presentation of organics. Rockshelters in the Mogollon Highlands have been important sources of data for the arrival and development of agriculture in the late preceramic period, but most lack significant components older than 3000 to 4000 B.P. The same is true for many cave sites on the southern Colorado Plateau, which may also contain Puebloan cliff dwellings atop Basketmaker II and earlier deposits. Unfortunately, cave records are also subject to disturbance by post-occupational, cultural, and natural processes that may compromise their integrity and value.

Time, Culture, and Projectile Points

The segregation and dating of Archaic industries are largely dependent upon projectile points. Although other elements of artifact assemblages (ground stone, woven artifacts) have been scrutinized for such uses, projectile points remain the only common, durable tools with proven value in these tasks. Although they are the principal guide fossils for studies of both cultural affinities and time, Archaic projectile points are often vaguely defined, usually only in terms of gross morphology (Haury, 1950), and relatively poorly dated. More recent approaches emphasize metric measurement of attributes and statistical manipulation of data (Thomas, 1981; Holmer, 1986, Phagan, 1988a and b; Moore, 1994). Further, because they were subject to breakage and, when possible, repair, their morphologies may vary not only as a function of the original intent of the manufacturer but as a result of situational decisions made in the repair process following breakage. A recent technological study has suggested that the breakage and subsequent repair of certain notched points can theoretically account for

nearly all other major notched and stemmed dart point series known from the Great Basin (Flenniken and Wilke, 1989). If correct, this hypothesis would mean that projectile point morphology is best explained by technological factors, and not by cultural preferences or change through time. Others have disputed this claim, showing that supposed secondary, reworked types are not smaller and lighter as would be predicted if they were the products of breakage and reworking (Bettinger *et al.*, 1991). O'Connell and Inoway (1994) have demonstrated that at least certain of these types in the northern Great Basin do behave in chronological fashion. While morphological change as a product of damage and reworking is undoubtedly a reality, it seems that in the eastern Great Basin and North American Southwest, some (but not all) different dart points have temporally limited periods of popularity (Holmer, 1986; Jennings, 1986; for discussion see Grayson, 1993). Finally, the meaning of projectile point variation in social or functional terms remains an unresolved topic. These concerns are raised as cautions, for it is impossible to discuss the Archaic period without using projectile point types to identify spatial and temporal variation across the North American Southwest. With these considerations in mind, let us turn to the empirical record of Archaic prehistory.

ARCHAIC BEGINNINGS

By at least 8000 to 8500 years before present, one-hand manos and slab metates, the hallmarks of the Archaic period, are present throughout the Southwest. There are hints, however, that the Archaic may extend farther back in time in some parts of the region, especially southern Arizona.

The oldest artifact-bearing deposit in Ventana Cave in southwestern Arizona produced an artifact assemblage dominated by scrapers of various forms, choppers, gravers, disks, two points, and miscellaneous implements. Also present was a single ground stone discoid, perhaps a mano. Known as the Ventana Complex and long believed to be of late Pleistocene age, recent AMS radiocarbon dating indicates that it probably dates between approximately 10,700 and 8700 B.P. and, perhaps more narrowly, to the period between 9500 and 8700 B.P. (Huckell and Haynes, 1995). Although likened first to Folsom (Haury, 1950) and later to Clovis (Haury and Hayden, 1975), reanalysis of the artifacts suggests much closer affinities with early Holocene Archaic complexes of the Great Basin and Mohave deserts, as well as with the earliest clearly Archaic manifestations in southeastern Arizona (Haynes and Huchell, 1995). The bones of extinct fauna found with the artifacts may be derived from an underlying Pleistocene deposit lacking artifacts.

In 1974–1975, reinvestigation of the Lehner Ranch Clovis site in southeastern Arizona revealed scattered traces of a younger occupation several centimeters above the Clovis horizon (Haynes, 1982). Present were 10 pieces of hard-hammer percussion flaked stone debitage, a chopper, one utilized flake, and six pieces of fire-cracked rocks, but no ground stone implements (Huckell, unpublished data). Although not culturally diagnostic, the artifacts are technologically and lithologically distinct from those of the underlying Clovis occupation. Moreoever, fire-cracked rocks are common at Archaic, but not Paleoindian, sites. Haynes (1982) reported two associated radiocarbon dates of approximately 9800 to 9900 B.P. Waters (1986b) assigned this assemblage to the Early Archaic Sulphur Spring stage of the Cochise Culture, but the small sample size and dates that are as much as a millennium or more older than those from clear Sulphur Spring sites suggest caution in assessing the affinities of this material.

These two sites demonstrate that in the southern part of the North American Southwest, there were industries that may have dated to the very early Holocene, prior to 8500 or 9000 B.P. Although coeval with the classic Paleoindian industries known from the Plains, it seems clear that their affinities are closer to preceramic complexes of the desert West. Irwin-Williams (1973; also see Judge, 1973; Carmichael, 1986) reported Cody (Eden) Complex Paleoindian occupations in west-central New Mexico dating to approximately 7500 to 8600 B.P. Northern Plains Cody sites generally date between 8400 and 9400 B.P. (Frison, 1991). The presence of typical late Plains Paleoindian sites in the northern and eastern half of the Southwest led Irwin-Williams to suggest the possible coexistence of Early Archaic and late Paleoindian cultures. The ultimate source of Archaic populations, assuming that they had a separate origin, may have been the Great Basin, where such economic systems were in place by at least 9000 to 10,000 B.P. (Grayson, 1993).

THE EARLY ARCHAIC PERIOD

By 8000–8500 B.P. there is clear evidence that the Archaic period had begun across the region. There are four subregional models for the Early Archaic period: a northern Colorado Plateau/eastern Great Basin complex; the Jay and Bajada phases of the Oshara Tradition; the Sulphur Spring stage of the Cochise Culture; and the Gardner Springs phase of the Chihuahua Tradition.

The Sulphur Spring Stage of the Cochise Culture

The Sulphur Spring stage of the Cochise Culture was identified by Sayles and Antevs (1941) from Whitewater Draw in southeastern Arizona. From six sites exposed in the vertical-walled draw, Sayles recovered assemblages of artifacts dominated by large numbers of milling stones (grinding slabs or metates) and handstones (manos) as well as unifacially retouched scrapers and other tools. Projectile points were absent, but bones of extinct and extant animals were found. Also present were fire-cracked rocks, broken, burned animal bones, and, at two sites, fragmentary human skeletons. In addition, bones of a mammoth had been excavated in 1926 from a deposit stratigraphically above the artifacts at the principal "type" site at Double Adobe. Geologic estimates of the age of the complex suggested that it was more than 10,000 years (Antevs, 1941). With the advent of radiocarbon dating in the early 1950s, two samples of charcoal believed to be associated with the Sulphur Spring stage were dated, yielding results of roughly 6200 and 7800 B.P.; both dates were rejected by Sayles as too young.

Additional excavations at some of these sites in the early 1950s led to the definition of the Cazador stage. It differed from Sulphur Spring primarily in having projectile points and bifaces and greater quantities of flaked than ground stone artifacts, and was radiocarbon dated to 8200 to 9400 B.P. (Sayles, 1983, pp. 90–113). Sayles accordingly revised the dating of the Sulphur Spring stage to between 11,000 and 14,500 B.P. and placed the Cazador stage between 11,000 and 8000 B.P.

Waters (1986b) reinvestigated several of Sayles' sites along Whitewater Draw. He rejected the Cazador stage on geological grounds, finding that both the Sulphur Spring and the putative Cazador materials were derived from the same alluvial deposit at Double Adobe and that Cazador deposits at two other sites were in younger alluvial deposits. Further, the artifacts tended to occur in fluvial sand and gravel deposits, clearly secondary contexts. He also obtained 10 radiocarbon dates from four Sulphur Spring stage localities; all fell between approximately 8100 and 9000 or 9300 B.P. (Waters, 1986a, Table 4.3). Waters also suggested the possibility that the Sulphur Spring stage might extend back beyond 10,000 B.P. Finally, he concluded that there was no good evidence for the primary association of Pleistocene fauna with the Sulphur Spring stage.

Unfortunately, no diagnostic projectile points have been recovered from good contexts at these sites, so it is therefore difficult to identify other Early Archaic manifestations in the southern part of the Southwest from surface materials. MacNeish and Nelken-Terner (1983) suggested the possibility that the Sulphur Spring stage extended southward from Arizona and

covered most, if not all, of northwestern Mexico. This is unsupported by published data.

Other Possible Early Archaic Material from Southern Arizona

From the Red Sand layer of Ventana Cave, resting atop the layer that contained the Ventana Complex, was recovered an assemblage of 54 flaked

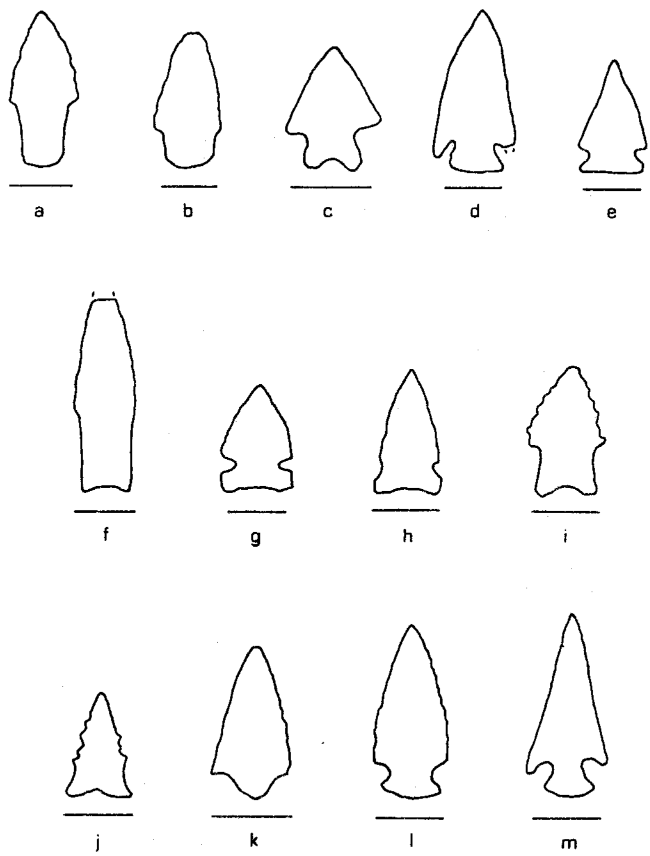

Fig. 5. Common projectile points for the North American Southwestern Archaic. (a) Jay, (b) Ventana-Amargosa, (c) Pinto, (d) Elko Corner-Notched, (e) Elko Side-Notched, (f) Bajada, (g) Northern Side-Notched, (h) Chiricahua, (i) San Jose-Pinto, (j) San Jose or Armijo, (k) Gypsum, (l) San Pedro, (m) Cienega. Bars under each are 2 cm long.

stone tools (Haury, 1950, pp. 200-204). No ground stone milling equipment was present, but the deposit covered only a small area and was also quite thin. Seventeen projectile points, all stemmed forms, were recovered, along with 4 small leaf-shaped bifaces, 22 scrapers, 4 planes, and 7 "knives." The points bear straight to slightly expanding stems with straight, convex, or, rarely, concave bases (Fig. 5b); Haury considered them sufficiently distinctive to merit the designation "Ventana-Amargosa points," and the assemblage as a whole was designated Amargosa I or Ventana-Amargosa I. Given that it is stratigraphically above the Ventana Complex, this deposit probably accumulated after 8700 B.P. The composition of the assemblage suggests use of the cave for specialized purposes, of which hunting was probably an important part.

From the northern Santa Rita Mountains of southeastern Arizona, Huckell (1984) identified four possible Early Archaic period sites or site components. The suggestion was based on the recovery of what were described as long tapering stemmed points, morphologically similar to Great Basin Stemmed series, Ventana-Amargosa points, and Jay points. Ground stone tools were found at three of the four sites. Unfortunately, all were surface or near-surface occupations that lacked datable materials, so the suggestion of their potential Early Archaic age rests solely on projectile point morphology.

The Gardner Springs Phase of the Archaic Chihuahua Tradition

From southern New Mexico and northern Chihuahua, Richard S. MacNeish (1993) has defined the Archaic Chihuahua Tradition. The earliest phase of this tradition, Gardner Springs, is dated between approximately 8000 or 8500 to 6000 B.P. The artifacts illustrated as typical of the phase (MacNeish, 1993) include points described as Jay or Jay-like, Bajada, and Baker, as well as a range of bifaces, scrapers, choppers, and gravers. Ground stone pestles, mortars, and milling stones are also apparently part of the material inventory. MacNeish suggests that the phase compares best to the Sulphur Spring stage, the Jay phase, and the earliest complexes in Ventana Cave.

Inferences concerning the material composition of the phase appear to have been derived from two excavated sites, Todsen Shelter and North Mesa, as well as survey data. However, the radiocarbon dates came not from these sites but from Fresnal Cave, a rockshelter in the Sierra Blanca Mountains east of Alamogordo, and from charcoal associated with an apparently isolated metate in an arroyo east of the San Andres Mountains. Fresnal Shelter, dug in the early 1970s, has not been fully analyzed or pub-

lished. While these dates make it clear that there is a human presence in the area at that time, so little is known of the Gardner Springs phase artifact assemblage that it may best be viewed with caution.

The Jay and Bajada Phases of the Oshara Tradition

The Jay and Bajada phases of the Oshara Tradition were defined by Irwin-Williams (1973) from west-central New Mexico and are the accepted standard for Early Archaic throughout much of northern New Mexico despite the fact that the primary data remain unpublished. The diagnostic points of the two phases were recognized by Renaud (1942) as "Rio Grande points," and the points and other components of the artifact assemblage were subsequently called the "Rio Grande Complex" by Honea (1969). As proposed by Irwin-Williams (1973, 1979), the Jay phase is typified by a large point with an elongated, often ground, tapering stem with a convex base (Fig. 5a). Nonprojectile implements include bifaces and scrapers; ground stone milling equipment was believed absent. Bajada points differ slightly from Jay in having more parallel-sided stems and concave bases (Fig. 5f); relative stem length is suggested to gradually diminish from the early part of the phase. Other flaked implements were similar to those of the Jay phase, and again ground stone was not recovered. Cobble-filled pit hearths or ovens were the only features recognized at Bajada sites. Irwin-Williams' radiocarbon dates suggested that Jay dated to between 7500 and 6800 B.P, and Bajada from 6800 to 5200 B.P.

Thirteen Jay phase sites on Gallegos Mesa in northwestern New Mexico, excavated in the late 1970s and early 1980s, provide an expanded view of the phase. Data from these sites indicate that they range from approximately 8000 to 7000 B.P., are far larger and have greater artifact densities than Jay sites reported by Irwin-Williams, and contain ground stone milling equipment (Vogler *et al.,* 1993; Wiens 1994). Bajada phase sites investigated in this project area were generally similar to Jay sites in terms of numbers, artifact assemblage composition, and feature types but tended to be slightly smaller in size.

Investigations in the San Juan Basin (Chapman, 1977; Moore, 1980; Vogler *et al.,* 1993; Wiens, 1994; Vierra, 1994b) and other parts of northwestern New Mexico, as well as northeastern Arizona (Sims and Daniel, 1967; Windmiller and Huckell, 1973; Huckell, 1977; C. Berry, 1984; Burton and Farrell, 1993) have demonstrated that both Jay and Bajada points and sites are widespread. Bajada and occasional Jay points can also be recognized among illustrated points reported from assemblages from southeastern Utah (Mohr and Sample, 1959; Hunt and Tanner, 1960) and

southwestern Colorado (Phagan, 1988a), suggesting that both types are scattered across the central Colorado Plateau. They appear to extend southward from central New Mexico into Chihuahua (Haynes, 1955; Carmichael, 1986; Seaman *et al.*, 1988; Wiseman, 1993).

The shallowly buried Hastqin Site in northeastern Arizona contained an occupation surface marked by basin-shaped hearths and scattered artifacts (Huckell, 1977). Charcoal from two hearths yielded dates of approximately 8000 and 8200 B.P. In addition to a small tool assemblage dominated by bifaces and scrapers, a complete Bajada point and a fragmentary Jay (?) point stem were recovered with fragmentary grinding slabs and unshaped one-hand manos.

One tested rockshelter and one open site on northern Black Mesa in northeastern Arizona also produced evidence of Early Archaic occupation (Parry *et al.*, 1994). The deepest cultural level (14) in Tsosie Shelter yielded two radiocarbon dates of roughly 8100 and 7100 B.P. A very small assemblage of flaked stone implements and one metate fragment came from this level of the shelter. Two other Archaic occupations were recognized above level 14. Levels 10 and 13 (10 rested directly atop 13) produced a slightly larger assemblage of flaked and ground stone artifacts, associated with dates of 5600 B.P. (stratum 10) and 6800 B.P. (stratum 13). No projectile points were recovered from these levels. From the open site came an assemblage of flaked stone implements and debitage plus two points, one likened to Bajada and the other to San Jose. Smiley and Parry (1990) consider both sites Early Archaic.

The Northern Colorado Plateau Early Archaic

An alternative formulation of the Early Archaic period derived from the northern Colorado Plateau has recently been summarized by Matson (1991; also see Berry and Berry, 1986; Geib, 1995), who proposes a "Pinto point-dominated" Early Archaic. Matson relies primarily on information from two stratified Utah rockshelter sites—Sudden Shelter (Jennings *et al.*, 1980) and Cowboy Cave (Jennings, 1980)—to support his model. These two well-excavated sites have had a tremendous impact on perceptions of the material composition and dating of the Archaic in the Southwest (Berry and Berry, 1986).

The deepest dated deposits at Sudden Shelter (strata 1–5) produced small numbers of Pinto points and Elko series (side-notched and corner-notched) points (Figs. 5c–e), along with flake knives, scrapers of various forms, and bifaces. Only Pinto points ($n = 4$) were found in the lowest two strata; Elko series points first appeared in stratum 3. One-hand manos

and slab and basin metates were also present. Five radiocarbon assays from strata 2 through 5 ranged from 7900 to 6800 B.P. (Jennings, 1980, Table 1). At Cowboy Cave, the earliest definitely culture-bearing deposit (Unit IIb) lacked diagnostic projectile points but was dated to approximately 8300 B.P. The overlying Unit III deposits, containing Elko series and Northern Side-notched points (Fig. 5g), are dated to between 6300 and 7200 B.P. (Schroedl and Coulam, 1994). Ground stone milling equipment is present in Unit IIb and throughout Unit III, and the nonprojectile portion of the flaked stone assemblage is very similar in composition to that from Sudden Shelter. Cowboy Cave also produced perishable textiles that included cordage, basketry, and sandals. Schroedl and Coulam (1994) reported four shallow, subcircular pitstructures from Unit III; these represent the earliest known habitation features in the North American Southwest (Fig. 6a). No evidence of superstructures remained, but each pitstructure contained at least one hearth or ash pit. Other Early Archaic features included nonthermal pits, ash pits or hearths, and milling stone concentrations.

Among the first of the northern Colorado Plateau Early Archaic manifestations to be recognized was the Desha Complex (Lindsay *et al.*, 1968), found in Dust Devil Cave and Sand Dune Cave in southeastern Utah. A distinctive open-twined type of sandal was present at both sites, and portions of three from Sand Dune Cave dated between approximately 7700 and 7200 B.P. Projectile points clearly associated with the Desha Complex were few, although a semiflexed burial in Sand Dune Cave yielded two Pinto points and three broadly side-notched points later named Sand Dune Side-Notched (Lindsay *et al.*, 1968; Geib and Ambler, 1991). Matson (1991) also suggests that Elko Side-Notched and possibly Elko Corner-Notched points are part of the Desha Complex. Phil Geib informs me that Elko Side-Notched points and Pinto points were recovered from the Early Archaic levels of Dust Devil Cave. Unfortunately, intrusive objects from younger occupations, coupled with excavation methodology, make it difficult to be certain of the material composition of the Desha Complex.

Geib and Davidson (1994) reported an Early Archaic occupation in Old Man Cave, a vandalized rockshelter on Cedar Mesa in southeastern Utah. Test excavations and salvage of specimens from pothole backdirt produced a typical Early Archaic/Desha Complex open-twined sandal. It was radiocarbon dated to approximately 7400 B.P., and four other radiocarbon dates between 5900 and 7600 B.P. were obtained.

Matson (1991; also Berry and Berry, 1986) argued that the Early Archaic of the northern Colorado Plateau is representative for the rest of the Southwest. He identified Pinto points as widespread, and argued that they are a reliable marker for the Early Archaic. He also suggested that the Jay and Bajada phases of the Oshara Tradition are of questionable value as a

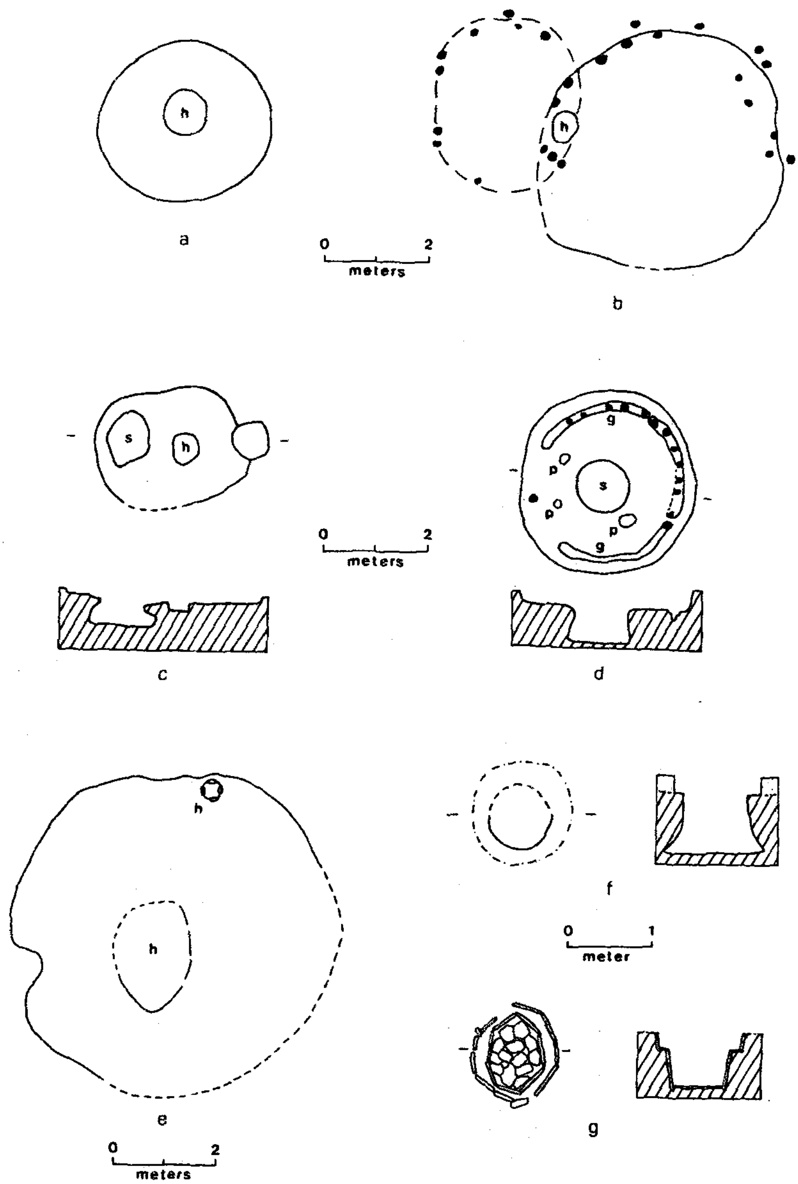

Fig. 6. Archaic domestic structures and storage features from the North American Southwest. (a) Early Archaic, southeastern Utah, (b) two superposed Middle Archaic structures, north-central New Mexico, (c) Late Archaic/Early Agricultural (San Pedro), and (d) Late Archaic/Early Agricultural (Cienega), southeastern Arizona, (e) Late Archaic/Early Agricultural (Basketmaker II), northeastern Arizona, (f) Late Archaic/Early Agricultural bell-shaped storage pit, (g) Late Archaic/Early Agricultural slab-lined cist (Basketmaker II). Abbreviations: h-hearth; s-storage pit, g-floor groove, p-pit, solid black circles are postholes.

model for the Early Archaic of the Colorado Plateau and that they should not be used until more of Irwin-William's data are published. Bajada points he viewed as simply a variety of Pinto points, and that given their morphological similarities to Lake Mohave and other Great Basin Stemmed Series points, as well as Hell Gap points from the Plains, Jay points are probably much older than Irwin-William's dates would suggest. Matson proposed that Jay points may represent what he terms the "earliest" Archaic.

The degree to which the northern and central Colorado Plateau sites are typical of the Early Archaic for the entire North American Southwest is difficult to assess in light of present data. Both Sudden Shelter and Cowboy Cave lack components older than 8000 B.P. with diagnostic points. A lack of projectile points from 8000 to 9000 year old Early Archaic sites in the southern part of the Southwest further confounds comparisons to both the Jay/Bajada phases and the northern Colorado Plateau records. Pinto points, which may date from roughly 4000 to 7000 B.P. (Jenkins and Warren, 1984) or back to 7900 to 8400 B.P. (Jenkins, 1987) in the Great Basin, may be difficult to use as temporal markers until more is known of their age range in the Southwest and their typology is better controlled. Moreoever, Elko series points on the northern Colorado Plateau may appear by 8000 B.P. but may recur over the next 9000 years (Holmer, 1986), making them unreliable as Early Archaic diagnostics. In summary, knowledge of the Early Archaic period in the North American Southwest is embryonic but suggests that variability in material culture may exist across the region. Perhaps a more fundamental issue is whether the central and northern Colorado Plateau and other parts of the North American Southwest should be considered part of a culturally homogeneous region in the Early Archaic period.

THE MIDDLE ARCHAIC PERIOD

Beginning at approximately 5500 B.P. and lasting until 3500 B.P., the Middle Archaic is a time when regional differences tend to blur. Irwin-Williams (1967) recognized greater regional coherence after 5000 B.P., and proposed the Picosa acronym to distinguish it. She recognized distinctive subregions [Western, Southern, Northern, and later Southeastern (Irwin-Williams, 1979)], as well as early-late temporal distinctions across the regions. More recent research has confirmed regional similarities, as reflected by the occurrence of the same or similar projectile point styles over tremendous areas. Several projectile point styles—Chiricahua and other side-notched types, San Jose/Pinto, Gypsum, and Elko—may serve as temporal markers for Middle Archaic complexes. Additional types may also

occur in limited areas of the region. Again, subregional complexes provide different culture-historical formulations for the Middle Archaic.

The Southern Basin and Range

In southern Arizona and southern New Mexico, the Middle Archaic has historically been represented by the Chiricahua stage of the Cochise Culture. As originally defined, the Chiricahua stage was characterized by a continuity in grinding implements from the Sulphur Spring stage, as well as by the first appearance of basin metates, mortars, and pestles. Side-notched, concave base projectile points also appeared in the inventory, although they were believed intrusive (Sayles, 1941). Although not so named by Sayles, these points have come to be called Chiricahua points (Fig. 5h). Sayles and Antevs (1941) originally believed that this interval covered the period between 10,000 and 5000 B.P., although Sayles (1983) later revised this range to 8000 to 3500 B.P. Waters' (1986a) geoarchaeological research along Whitewater Draw produced no sites radiocarbon dated earlier than 3500 B.P. or younger than approximately 7000 B.P., causing him to suggest that the Chiricahua stage was no older than about 3500 B.P.

The excavation of Ventana Cave caused Sayles (1983) to expand the material inventory of the Chiricahua stage to include projectile points similar to (or identical with) Pinto, San Jose, and Gypsum (described in the following section). Haury (1950) labeled the assemblage of artifacts from the lower half of the moist midden deposit "Chiricahua-Amargosa II" and suggested that these deposits represented an admixture of Cochise Culture and Amargosa artifacts. In the Mogollon Highlands, Dick (1965) identified a Chiricahua component at Bat Cave, which he believed to contain maize dating to more than 4000 B.P. (Wills, 1988a)

Side-notched points either explicitly labelled Chiricahua points or clearly related forms have been recovered from sites in southwestern Arizona (Ezell, 1954; Haury, 1950; Bostwick, 1988; Halbirt and Henderson, 1993), southeastern Arizona (Agenbroad, 1970; Dart, 1986, 1989; Slawson, 1987; Waters and Woosley, 1990; Phillips *et al.*, 1993); northeastern Arizona (Wendorf and Thomas, 1951; C. Berry, 1984; Burton and Farrell, 1993; Tagg, 1994), northwestern New Mexico (Bryan and Toulouse, 1943; Martin *et al.*, 1949; Dick, 1965; Chapman, 1977; Moore, 1980, 1994; Vogler *et al.*, 1993), south-central New Mexico (Eidenbach, 1983; Carmichael, 1986; Seaman *et al.*, 1988; MacNeish *et al.*, 1993) and southwestern New Mexico (Formby, 1986).

Radiocarbon dates for sites yielding Chiricahua points are few. They were recovered from several sites in the Picacho Reservoir area of central

Arizona, and at one, the Arroyo Site, they were associated with three radiocarbon dates of 3900, 4500, and 4800 B.P. (Bayham *et al.*, 1986). With the points were bifaces, cores, and debitage, and ground stone milling equipment. Although not yet published, a 4300-year-old buried site in the Tucson area of southeastern Arizona yielded a fragmentary Chiricahua point, bifaces, scrapers, utilized flakes, cores, and debitage, as well as slab metate fragments and one-hand manos (Huckell, unpublished data).

Mention should be made of another recently named point type that appears to be of Middle Archaic age. Known as Cortaro (Roth and Huckell, 1992), it is little more than a triangular point with a concave base. Unlike the points discussed above, it is probably confined to the southern Basin and Range Province below the Mogollon Rim, especially in southeastern Arizona (Roth and Huckell, 1992). Specimens are also known from southwestern New Mexico (Hicks, 1988) and south-central Sonora (Ortiz and Taylor, 1972). Examination of its vertical distribution through the deposits of Ventana Cave suggested that it was slightly younger than the Pinto-San Jose type, but older than San Pedro points. A buried occupation site along the Santa Cruz River near Tucson in southeastern Arizona yielded several points of this type, in association with dates ranging between roughly 3700 and 4300 B.P. (David A. Gregory, personal communication). Its abundance in southeastern Arizona and apparent absence farther north are in striking contrast to the distributions of other styles across the entire North American Southwest.

In south-central New Mexico and perhaps northern Chihuahua, the Middle Archaic is represented by portions of two phases, Keystone (ca. 6300–4600 B.P.) and Fresnal (ca. 4600–2900 B.P.). Each is represented by a number of different point styles (MacNeish *et al.,* 1993), as well as other flaked and ground stone tools. Neither phase seems particularly well defined.

The Colorado Plateau

On the northern and central Colorado Plateau one finds side-notched projectile points similar to Chiricahua points: Northern Side-Notched (Fig. 5g), Sudden Side-Notched, and San Rafael Side-Notched (Holmer, 1986). In Sudden Shelter Northern Side-Notched points were recovered from levels 5 through 7; the two dates that bracket this set of deposits are between 6300 and 6700 B.P., which would place them in the Early Archaic (Holmer, 1980a). Other morphologically similar side-notched points occur in levels 7 through 16; level 16 falls between radiocarbon dates of roughly 4400 and 3500 B.P. In Cowboy Cave, Northern Side-Notched points were recovered

exclusively from Unit III, with radiocarbon dates of 6300 and 7200 B.P. bracketing their vertical distribution (Holmer, 1980b; Schroedl and Coulam, 1994). Viewing these large, side-notched points as a group, Holmer (1986) and Matson (1991) suggest that they probably date from perhaps as early as 7000 B.P. to as late as 3500 B.P. and, certainly, from 6000 to 4000 B.P. There are indications that Northern Side-Notched is the earliest of the series; San Rafael Side-Notched, with its more prominently concave base, may be younger (Holmer, 1986). Thus, it appears that some or all of this group of side-notched points are at least partly coeval with Chiricahua points. They may also be confused with Chiricahua points in the San Juan Basin (Vogler *et al.,* 1993). So-called Chiricahua points from a site in northwestern New Mexico associated with dates of 3900 to 3700 B.P. (Moore, 1994) are probably San Rafael Side-Notched.

Another point style ascribed here to the Middle Archaic is the Gypsum Cave type (Harrington, 1933); for Matson (1991) it is the hallmark of the Late Archaic. A similar if not identical variant, the Augustin point (Dick 1965), was named from Bat Cave in west-central New Mexico. Both type names see use in the Southwest, but Gypsum is used here. Morphologically, Gypsum and Augustin points are distinguished by a short, contracting stem, either pointed or rounded, and a triangular blade (Fig. 5k). Indications are that Gypsum points are at least in part younger than either Chiricahua or San Jose, although again dates are few over most of the region.

Gypsum points have been recovered from all parts of the Southwest. In addition to the central and southeastern Utah rockshelters noted above, they have been reported from the Moab (Hunt and Tanner, 1960) and Aneth areas (Mohr and Sample, 1959). They are present in northwestern New Mexico (Agogino and Hester, 1956), west-central New Mexico (Dick, 1965; Beckett, 1980; Formby, 1986), south-central New Mexico (Eidenbach, 1983; Carmichael, 1986; Seaman *et al.,* 1988; MacNeish, 1993), southeastern Arizona (Agenbroad, 1970; Huckell, 1984; Dart, 1989), south-central Sonora (Ortiz and Taylor, 1972), southwestern Arizona (Haury, 1950), central Arizona (Bayham *et al.,* 1986; Huckell, 1973), northeastern Arizona (Wendorf and Thomas, 1951; C. Berry, 1984), and northwestern Arizona (Formby, 1986).

Southeastern Utah has produced the bulk of the chronometric information for Gypsum points. At Sudden Shelter, they were recovered from strata 15 through 22, where they only slightly overlapped with side-notched point styles. Radiocarbon dates from these levels ranged from approximately 4400 to 3400 B.P. From Aspen Shelter, only 5 km to the north, Gypsum points were found in levels dating between approximately 4100 B.P. and perhaps 2100 B.P. (Janetski *et al.,* 1991). In Cowboy Cave the type occurred in Stratum IV and the lower part of Stratum V. Dates from

Stratum IV fall in the mid-3000 B.P. range, and lower Stratum V may be as recent as 1900 or 2100 B.P. Schroedl and Coulam (1994) argue that the type ceased to be made after about 3500 B.P. and that their association with younger dates at Cowboy Cave is due to cultural reworking of older deposits. Holmer (1986) suggests that the type spans the period between 4500 and 1500 B.P.

Elko series points also occur during this time interval on the northern Colorado Plateau/eastern Great Basin. Holmer (1986) documented that this series is extremely long-lived, occurring during at least three separate intervals over the last eight millennia. He reported them from contexts dated between 8000 and 5500 B.P., between 5000 and 3000 B.P., and from 2000 to 1000 B.P. (Holmer, 1986). Elko series points are known sparingly from sites across the southern Colorado Plateau (e.g., see Burton and Farrell, 1993) and into the southern Basin and Range (Huckell, 1984). Their actual abundance is difficult to evaluate because they may be confused with other corner- and side-notched types that are common on the Colorado Plateau (Basketmaker II points) or in the basin and range (San Pedro and Cienega points).

The San Jose and Armijo phases of the Oshara Tradition (Irwin-Williams, 1973) subsume the San Jose Complex of Bryan and Toulouse (1943). Irwin-Williams dated the San Jose phase as falling between 5200 and 3800 B.P, and the Armijo phase between 3800 and 2800 B.P.; the latter extends into the Late Archaic/Early Agricultural period. San Jose and Armijo sites include large campsites, and Irwin-Williams (1973) believed that maize made its initial appearance in the Armijo phase. Like Pinto, San Jose has been somewhat of a catchall category over the past few decades. At least two forms may be distinguished on the basis of basal morphology: a short, straight-stemmed or slightly expanding stemmed form with a concave base or basal notch and a short, flaring-stemmed variant with a broadly concave base (Figs. 5i and j). Serrated blades are common on both. For Irwin-Williams (1973) the former were San Jose points and the latter Armijo, although the original definition of Bryan and Toulouse (1943) included both forms. "Pinto" has also been used to describe both variants. For ease of reference, San Jose-Pinto is employed here. In addition to Armijo points, Irwin-Williams apparently also included side- or corner-notched points similar to Basketmaker II specimens in her Armijo phase, so the Armijo point is not completely isomorphic with the phase.

Both straight-stemmed and slightly concave-sided, expanding stemmed San Jose-Pinto points have been recovered from a number of sites across the North American Southwest. They are abundant at sites in northwestern New Mexico (Bryan and Toulouse, 1943; Chapman, 1977; Moore, 1980), south-central New Mexico (Carmichael, 1986; Seaman *et al.*, 1988; Wiseman, 1993), southwestern New Mexico (Formby, 1986), southeastern

Arizona (Agenbroad, 1970; Huckell, 1984; Dart, 1986; Waters and Woosley, 1990; Phillips *et al.*, 1993), central Arizona (Huckell, 1978; Dosh *et al.*, 1987; Bayham *et al.*, 1986), southwestern Arizona (Haury, 1950; Ezell, 1954), northeastern Arizona (Wendorf and Thomas, 1951; Windmiller and Huckell, 1973; C. Berry, 1984; Burton and Farrell, 1993), southeastern Utah (Mohr and Sample, 1959; Hunt and Tanner, 1960), and southwestern Colorado (Phagan, 1988b).

One buried site in the San Juan Basin yielded three San Jose points in a stratum with a hearth dated to between 5900 and 5600 B.P. (Del Bene and Ford, 1982, p. 706). A second buried site in the same area had a single San Jose point near a hearth dated between 4000 and 5400 B.P. (two samples produced radically different results). Moore (1994) reports obsidian hydration dates on San Jose points of approximately 4000 B.P. and, for Armijo points, a range from 2000 to 3800 B.P. From a buried dune in the Picacho Reservoir Project area of central Arizona, came an assemblage that included five "San Jose/Pinto" points and a fragmentary lanceolate point and three associated radiocarbon dates of between 4000 and 4300 B.P. (Bayham *et al.*, 1986) In addition to the points, this site produced considerable numbers of one-hand manos and slab metates, bifaces, cores, debitage, and fire-cracked rocks.

An intriguing possibility is that Chiricahua and San Jose points, as well as Cortaro points, perhaps, may be contemporaneous in south-central Arizona (Bayham *et al.*, 1986). Whether this signifies the use of multiple styles by a single cultural group or the existence of separate but coeval cultural groups, each with a distinctive style, is an unanswered question.

Middle Archaic Features

Investigations of Middle Archaic period sites on the Colorado Plateau have produced several kinds of features. In the last few years, evidence of domestic structures has been accumulating from sites in New Mexico. Irwin-Williams (1973) first detected the presence of simple structures marked by irregular outlines and posthole patterns at San Jose and Armijo phase sites in west-central New Mexico. Recent investigations by Schmader (1996) along the central Rio Grande Valley north of Albuquerque have confirmed the presence of shallow, subcircular, 2.0- to 4.5 m diameter pitstructures in several sites ranging in age from about 4500 to 3500 B.P. (Fig. 6b). Patrick Hogan informs me other sites in this same general area plus the San Juan Basin have yielded similar structures up to 3.5 to 4.0 m in diameter dating between 4000 and 3000 B.P. Near El Paso, Texas, O'Laughlin (1980) reported Middle Archaic pitstructures from the Keystone Dam Site dated

to between 4500 and 3800 B.P. They too were simple, shallow, subcircular to irregular basins 3 m or less in diameter. Possible hearths, represented by ashy areas, were present inside. Whalen (1994) mentions the existence of additional smaller pitstructures in the same area dating between 4700 and 2200 B.P. In southeastern Arizona, one multicomponent Archaic site produced a rock alignment suggestive of a windbreak; it may be of Middle Archaic age (Huckell, 1984). These structures tend to occur at sites with relatively low artifact densities, no obvious storage features, and a range of radiocarbon dates spanning several centuries. Such attributes do not suggest intensive or sedentary occupation.

Extramural features at Middle Archaic sites are limited to basin-shaped hearths, rock-filled pits, clusters of fire-cracked rocks, and caches of ground stone implements (Irwin-Williams, 1973; Agenbroad, 1970; Windmiller, 1973; O'Laughlin, 1980). A few inhumations are known from the region. From Tucson in southern Arizona two burials were recovered from beneath rock cairns at separate sites (Dart, 1986; Huckell, unpublished data). One of these was in a flexed position, lying on the side, and both lacked offerings in clear association. Waters (1986a) reported a partial flexed burial in a deposit at least 3500 years old in southeastern Arizona, and Haury (1950) found three burials (two flexed) in deposits some 2000 years old or more at Ventana Cave.

"Split Twig" Figurines and Rock Art

A striking Middle Archaic perishable figurine industry has been discovered in rockshelters in southeastern California, northwestern Arizona, southern Nevada, and southeastern Utah (Schroedl, 1977; Janetski, 1980; Davis and Smith, 1981; Euler, 1984; Emslie *et al.*, 1987). The name Grand Canyon figurine complex has been suggested for them, but they are commonly known as split twig figurines. They occur in rather inaccessible, nonhabitation sites, often in cached groups of two or more, as well as with split and unsplit twigs and small and large rock cairns. (Euler, 1984; Emslie *et al.*, 1987). Thus, the figurines may have played a role in some hunting-related ceremonial activities. Their presence in apparent midden deposits in Cowboy Cave and other shelters in southeastern Utah may imply alternative, perhaps secular functions. Radiocarbon dates on split twig figurines range between approximately 4100 to 3000 B.P., and they may be associated with the makers of Gypsum, Elko, or (less likely) Pinto points.

By at least Middle Archaic times, and continuing through the Late Archaic/Early Agricultural period, petroglyphs and pictographs are probably being created across the entire North American Southwest (Schaafsma,

1980; Cole, 1990, 1994; Thiel, 1995). The petroglyphs include linear geometric and representational elements, and it appears that at least three styles (Western or Desert Archaic, Glen Canyon Linear, and Archaic Scratched) are present. Pictographs are dominated by anthropomorphs but include geometrics as well. These too are separable into subregionally and/or temporally distinct styles such as Barrier Canyon and Chihuahuan Polychrome Abstract. Some geometric elements of Western Archaic petroglyphs are duplicated in Barrier Canyon pictographs. In Sonora, geoglyphs (boulder intaglios on the desert floor) of Archaic age may occur (Alvarez P. *et al.,* 1985).

THE LATE ARCHAIC/EARLY AGRICULTURAL PERIOD

The period between 3500 B.P. and 2000 or 1500 B.P. has been designated the Late Archaic period. However, accumulating evidence suggests that by at least 3000 B.P., and perhaps as early as 3500 to 4000 B.P., maize and other Mesoamerican cultigens arrived in the North American Southwest. Once seen as a rather minor addition to Archaic economies (Haury, 1962; Dick, 1965; Sayles, 1983), maize agriculture may have rapidly promoted significant changes in the material and organizational aspects of subsistence-settlement systems over much of the region. This transition from hunting and gathering to mixed farming-foraging has been the subject of a number of treatments in the past 15 years (Ford, 1981, 1984; Berry, 1982, 1985; Minnis 1985, 1992; Wills, 1988a,b, 1990, 1992; Huckell, 1990, 1995, 1996; Matson, 1991; Wills and Huckell, 1994; Hogan, 1994; Smiley, 1994; Vierra, 1994b). A decrease in residential mobility, commitment of labor and facilities to the farming of maize and other crop plants, and increased reliance on the storage of maize and other foodstuffs signal the termination of the purely hunting-gathering, Archaic lifeway. In recognition of these changes, revival of the term "Early Agricultural period" has been proposed as an alternative designation for this period (Huckell 1995; for a history of the term see Woodbury 1993, p. 223). However, it is likely that the shift to a mixed farming-foraging economy did not take place at the same time over the entire Southwest; in recognition of this, "Late Archaic" may be reserved to describe the cultures in more arid parts of the North American Southwest that continued as hunter-gatherers after 3500 to 3000 B.P. With the appearance of ceramic vessels in the early centuries A.D., the Late Archaic/Early Agricultural period comes to a close.

The Early Agricultural Period in the Southern Southwest

South of the Mogollon Rim, this period of time is represented by the San Pedro stage of the Cochise Culture. As originally characterized by Sayles (1941, 1945, 1983), San Pedro sites tended to be relatively large, had higher densities of artifacts and fire-cracked rocks, and displayed a range of feature types that included small, shallow, oval pithouses with intramural bell-shaped pits and hearths (Fig. 6c), extramural bell-shaped pits (Fig. 6f), and flexed burials. A side- to corner-notched point was typical for the San Pedro stage (Sayles, 1941, Pl. 16c-d) (Fig. 5l). Other flaked stone implements included lanceolate bifaces, a variety of scrapers and other unifacially retouched flake tools, axes or choppers, and hammerstones. Ground stone implements included one-hand manos, some carefully pecked to shape, basin metates, small and large mortars, and pestles. Additional research by Haury (1950) and Eddy (1958; Eddy and Cooley, 1983) amplified Sayles' definition of the artifacts characteristic of the stage, adding bone awls, antler flaking tools, and stone vessels or trays. Research conducted at Milagro, a San Pedro site near Tucson, revealed the presence of fired clay anthropomorphic figurines and marine shell jewelry (Huckell, 1990; Huckell *et al.*, 1994). Sayles (1983) dated the San Pedro stage to between 3500 and 2000 B.P.

Following Sayles' definition of this stage, San Pedro points (and thus San Pedro Cochise sites or related manifestations) were recognized across southern Arizona (Haury, 1950; Ezell, 1954), Sonora (Johnson, 1963; Fay, 1967; Ortiz and Taylor, 1972), central New Mexico (Cosgrove, 1947; Dick, 1965; Campbell and Ellis, 1952), southern New Mexico (Carmichael, 1986; MacNeish, 1993), and northern Chihuahua (Roney, 1996). Local variants of San Pedro—the Peralta Complex (Fay, 1967) of Sonora and the Atrisco Focus of the middle Rio Grande Valley (Campbell and Ellis, 1952)—were also defined.

It was not until the early 1980s that evidence of San Pedro agriculture was discerned in the southern Southwest. Work in southeastern Arizona produced carbonized maize macrofossils from San Pedro stage sites in the Tucson area (Fish *et al.*, 1986; Huckell 1990; Huckell *et al.*, 1994), dated with AMS assays ranging from 2900 to 2400 B.P. Maize—the only cultigen yet identified in southeastern Arizona San Pedro sites—was found to be abundant at Sayles' original San Pedro stage type site on the San Pedro River in southeastern Arizona (Huckell, 1990). An abundance of seeds of wild annual and perennial plants suggests the breadth and balance of San Pedro subsistence (L. Huckell, 1994). The sizes and numbers of bell-shaped pits also reveal considerable reliance on in-the-ground storage. Thus, by at

least 3000 B.P., a mixed farming-foraging economy was established in the southern portion of the Southwest.

In southeastern Arizona, a slightly younger phase, Cienega, has recently been identified (Huckell, 1995). It differs from San Pedro in projectile point stylistic attributes, architectural forms (Fig. 6d), and an elaborate ground stone assemblage. Cienega points are diagonally corner-notched (Fig. 5m), but otherwise the flaked stone assemblage mirrors that of San Pedro. The ground stone assemblage, however, includes large perforated stone rings of uncertain function, discoids, well-made rectangular stone trays, small disks, and rods. Structures are round rather than oval, and lack the prominent intramural bell-shaped pits seen in San Pedro houses. They may, however, contain hearths and a wide range of sizes of cylindrical pits and have been found in villages containing more than 100 structures, as well as extramural pits and flexed burials (Mabry *et al.,* 1996). Occasional especially large (9 m diameter) structures, possibly communal, also appear. The Cienega phase may span the period after San Pedro, between roughly 2500 and 1800 B.P. In addition to maize, possible squash was recovered from Cienega sites, along with a wide range of wild plant taxa (L. Huckell, 1995). It should be noted that the Coffee Camp Site, although contemporary with the San Pedro and Cienega phases and containing numerous features, failed to produce maize (Halbirt and Henderson, 1993). Lying at the northwestern fringe of the well-watered part of southeastern Arizona, it hints at the possible persistence of purely hunting-gathering lifeways well into the first millennium B.C.

In south-central New Mexico, agriculture appears to arrive by at least 3000 B.P., but it does not seem to attain much dietary importance during the preceramic period (Upham *et al.,* 1987; Galinat, 1988; MacNeish, 1993; M. Whalen, 1994). In the Chihuahua Tradition phase sequence, this includes the latter part of the Fresnal phase (3600–2900 B.P.) and all of the Hueco phase (2900–1800 B.P.). The latter is typified by San Pedro and other corner-notched points. MacNeish (1993) notes the appearance of more perishable woven artifacts at this time, and larger ground stone milling equipment, including trough metates. Small pitstructures are also known, and appear to be much like their Middle Archaic predecessors (M. Whalen, 1994).

Few data are available for Sonora and Chihuahua, but there are indications that significant socioeconomic changes accompanied the Late Archaic/Early Agricultural period. In Sonora, San Pedro and Cienega points have been reported from the river valleys as far south as Hermosillo (Johnson, 1963; Doolittle, 1988; Ortiz and Taylor, 1972). New investigations at the La Playa site, first reported by Johnson (1963), have revealed that scores of burials and pit features there are of late preceramic age. Flotation

of pit fills has yielded carbonized maize there as well, the first direct evidence of preceramic agriculture in that state (Sanchez de Carpenter *et al.*, 1996). Recent work in northern Chihuahua by Roney (1996) has documented impressively extensive dry-laid rock terrace systems on hills (*cerros de trincheras*) adjacent to river floodplains. From the surface of these sites have come San Pedro and Cienega points, basin metates, one-hand manos, and no ceramics. These sites are as yet known only from survey but are interpreted as residential sites. It is likely that agriculture formed part of the subsistence base.

Early Agricultural Sites in the Mogollon Highlands

It is from the rockshelter sites in the Mogollon highlands of west-central New Mexico and east-central Arizona that some of the best known records of the Early Agricultural period have come. These include such sites as Bat Cave (Dick, 1965; Wills, 1988a), Tularosa and Cordova caves (Martin *et al.,* 1952), O Block Cave (Martin *et al.,* 1954), and the buried, open Cienega Creek Site (Haury, 1957). These were the first sites to provide firm evidence that the farming of maize—as well as squash, bottle gourd, and beans—was part of later Archaic period subsistence. Bat Cave was initially proposed to date to as early as 4300 B.P., but later work suggests that crops here were no earlier than about 3200 B.P. (Berry, 1982, 1985; Wills, 1988a). Martin and his colleagues labeled the assemblages from the cave sites they excavated simply as "Pre-Pottery," although recognizing continuity from the Archaic to ceramic period Mogollon culture. Dick (1965) made explicit use of Chiricahua and San Pedro stage Cochise culture terminology, as did Haury (1957) with the artifacts from the Cienega Creek Site. All of these sites yielded side- to corner-notched projectile points (Rinaldo, 1952, 1954; Dick, 1965) identical or generally similar to San Pedro and Cienega types (Wills 1988a). Other flaked stone implements included bifaces, drills, gravers, and scrapers (including numerous rather irregularly flaked unifacial tools) and core tools such as choppers and scraper planes. Ground stone seed milling equipment consisted of one-hand round to oval manos, and both slab and basin metates. Also present were bone awls, notched ribs, and antler flaking tools, along with perishable artifacts including basketry fragments, cordage, wickerwork and leather sandals, atlatls, atlatl dart foreshafts and mainshaft fragments, digging sticks, and other worked pieces of wood (Bluhm and Grange, 1952; Bluhm, 1952; Grange, 1952; Dick, 1965). The buried Cienega Creek Site in east-central Arizona contained numerous cremations, in contrast to the practice of inhumation that is well represented elsewhere in the Southwest at this time.

Storage pits were also recognized in Bat Cave and Tularosa Cave (Wills, 1988a). Radiocarbon dates suggest that these Early Agricultural period occupations probably fall between approximately 3200 and 1800 to 2000 B.P. (Wills, 1988a, Table 18). One also suspects that open sites with pitstructures probably exist in this region as well.

Early Agricultural Sites on the Southern Colorado Plateau

In the northern Southwest, the final preceramic culture on the Colorado Plateau is Basketmaker II, known since the beginning of the 20th century as the earliest agricultural manifestation in that area (Matson, 1991). Conceptually, it has always been linked to the Anasazi developmental sequence, and was long thought to be no earlier than about 2000–1500 B.P. Recent investigations have steadily pushed this date back well into the first millennium B.C. and potentially into the second millennium. Present data suggest that Basketmaker II may begin by 3500 B.P. and survive until as late as 1600 B.P. (Smiley *et al.*, 1986; Smiley, 1994; Gilpin, 1994). There is a long history of rockshelter investigations in southeastern Utah (Nusbaum, 1922; Lindsay *et al.*, 1968), northeastern Arizona (Kidder and Guernsey, 1919; Guernsey and Kidder, 1921; Guernsey, 1931; Lockett and Hargrave, 1953), and southwestern Colorado (Morris and Burgh, 1954). Jemez Cave in northwestern New Mexico may be added to this list (Alexander and Reiter, 1935). Open Basketmaker II sites were recognized more recently. Investigations of such sites has occurred in southeastern Utah (Matson, 1991, 1994a, 1994b; Dohm, 1994; Phil R. Geib, personal communication), northeastern Arizona (Smiley, 1994; Gilpin, 1994), and northwestern New Mexico (Eddy, 1961; Simmons, 1982, 1986).

Basketmaker II sites exhibit most of the changes described above for San Pedro sites, although they may be smaller in size and exhibit less intensive occupation. Round, shallow, pithouses (Fig. 6e), bell-shaped pits, and distinctive, often large, slab-lined cists (Fig. 6g) are found in open and rock shelter sites. Burials are common in rock shelters, often placed in cists or pits. Utilitarian material culture includes one-hand manos and slab metates, side- to corner-notched projectile points, well-made square-based bifacial knives, scrapers, and other retouched tools. Other aspects of material culture are known, from dry caves, to include the sophisticated woven industry that gave the culture its name (baskets of a variety of shapes and sizes, twined woven bags), wooden cultivating or digging implements, simple jewelry of stone, shell, bone, feathers, and seeds (pendants, beads, necklaces), atlatls and two-piece, composite darts, bone tools, and ritual

objects of bone, feathers, and stone. Basketmaker II anthropomorphic petroglyphs and pictographs are also widespread (Cole, 1990, 1994).

Basketmaker II sites are recognized from across the Colorado Plateau in southeastern Utah, southwestern Colorado, northwestern New Mexico, and northeastern Arizona. Matson (1991) has proposed that distinct temporal and spatial variants of Basketmaker II exist, including a fundamental east-west dichotomy based primarily on differences in weaving technology and architecture (San Juan Basketmaker to the west, Durango Basketmaker on the east). To him Basketmaker II is more a cultural stage than a single "culture." However, as in southeastern Arizona, by late Basketmaker II times agricultural dependence is suggested to be nearly as great as in subsequent Pueblo periods (Matson and Chisholm, 1991).

In northwestern New Mexico, the En Medio phase of the Oshara Tradition represents a possible variant of Basketmaker II, dated to between roughly 2800 and 1600 B.P. (Irwin-Williams, 1973; Irwin-Williams and Tompkins, 1968). Near Albuquerque, Reinhart (1967) identified what he termed the Rio Rancho complex or phase, which bears artifactual, architectural, and chronometric similarities to Basketmaker II. In the upper Rio Grande Valley, sites with small pitstructures and hearths have been excavated, although as yet no large storage features and no maize have been recovered from them (Schmader, 1996); their relationships to Basketmaker II are unclear. Gumerman (1966) identified the Black Creek phase as a Basketmaker II variant along the Rio Puerco of the West in northeastern Arizona.

The relationships between Basketmaker II and San Pedro have been the subject of thought for some time. Morris and Burgh (1954) first posited some relationship between the two, and Berry (1982; Berry and Berry 1986) suggested that Basketmaker II might represent the migration of San Pedro people onto the Colorado Plateau. Smiley (1994) has shown that current data support a rapid spread of agriculture from the United States–Mexico boundary north to at least the Arizona–Utah boundary. This implies some kind of contact and information flow, but to what degree the populations inhabiting the region were culturally or linguistically homogeneous is difficult to ascertain.

Late Archaic and Early Agricultural Occupation of the Northern Colorado Plateau

In southeastern Utah, the final occupation of Cowboy Cave has been labeled Terminal Archaic. It continues into the first millennium A.D., but materials in the upper deposit (unit V) are difficult to interpret. Unit V

contained Elko Corner-Notched and Gypsum points; the former is little different from many points assigned to Basketmaker II farther south (Lindsay *et al.,* 1968). However, small arrow points were also present, possibly by 1500 to 1800 B.P. Recent reinterpretation (Schroedl and Coulam, 1994) proposes that the Gypsum points are intrusive, having been brought up from the underlying Unit IV. A noteworthy difference between this late preceramic assemblage and Basketmaker II is the rarity of the typical two-rod and bundle basketry found at Basketmaker II sites on the central and southern Colorado Plateau (Hewitt, 1980; Matson, 1991). Maize occurred in a cache in unit V of Cowboy Cave, but appears to be no older than roughly 1800 B.P. (Schroedl and Coulam, 1994). The nature of this Terminal Archaic occupation is unclear, but it seems to have more in common with Great Basin hunting-gathering adaptations than with Basketmaker II. All indications are that maize does not seem to arrive in this area until the last centuries before Christ (Wilde and Newman, 1989; Smiley, 1994).

The preceramic period across the North American Southwest draws to a close with the arrival of ceramic vessel technology in the first millennium A.D. (Crown and Wills, 1995). While this is an admittedly arbitrary use of a material trait, the presence of ceramics marks the rise of the Anasazi, Mogollon, and Hohokam cultures.

RECONSTRUCTION OF ARCHAIC SUBSISTENCE AND SETTLEMENT

Beyond ongoing assessment of time-space systematics, considerable research effort has been devoted to reconstruction of Archaic forager use of resources. This topic has been approached from a number of avenues of inquiry, ranging from ethnographic analogy to foraging theory. Prior to 1970, observations about subsistence, seasonality, and mobility were generally simple analogies drawn from the work of Steward (1938, 1955), Service (1962, 1966), and Davis (1963), among others. With the rise of anthropological attention to hunter-gatherers in the late 1960s and 1970s, more attempts were made to try to understand the archaeological record of the Archaic period in terms of generalized theories of subsistence-settlement systems from cross-cultural ethnologic studies and from theoretical models of hunter-gatherer behavior. The work of Lee (1979), Yellen (1977), Binford (1980, 1982), Kelly (1983, 1992), and Bettinger (1991) has been particularly influential. The continuing development of optimal foraging theory and human evolutionary ecology has also facilitated the development of more sophisticated models of Archaic hunter-gatherers for the North American Southwest. Studies of Archaic land use patterns have

focused on the modeling of seasonal rounds of resource exploitation, the socioeconomic organization of resource procurement and processing, and changes in subsistence-settlement systems over time.

Archaic Seasonal Rounds

The North American Southwest, like other arid environments, is typified by both spatial and temporal discontinuities in resource distribution and abundance, as discussed previously. Most researchers assume that a given Archaic site or sites in a particular biotic community represent no more than one part of a complex pattern of seasonal movement and resource exploitation. A unifying feature of most models developed after 1970, regardless of the parts of the region where they were developed, is that Archaic hunter-gatherers must have had access to resources in desertscrub and grassland communities as well as higher elevation chaparral and woodland communities. Researchers have employed information on the times of the year at which particular plants and to a lesser degree animals are available for harvest and consumption today to predict seasonal movements by Archaic foragers (Whalen, 1971, 1975; Elyea and Hogan, 1983; Huckell, 1984; Wills, 1988a; Bostwick and Stone, 1988; Simmons *et al.*, 1989; Matson, 1991; Anderson, 1993; Vierra, 1994b). Empirical data from pollen, macrobotanical, and faunal remains, when available, have served to test and refine such models.

The preponderance of investigated Archaic sites occur in lowland environments. Botanical studies predict that because desertscrub or grassland communities are most productive during the spring through early fall, Archaic utilization of those communities should have occurred during one or more of those seasons. The few small samples of archaeobotanical remains—principally small-seeded annuals, grasses, and cacti—from northwestern New Mexico (Toll and Cully, 1994), south-central New Mexico (O'Laughlin, 1980; Whalen, 1994), and south-central Arizona (Raymer and Minnis, 1986) support this postulate. Faunal remains from sites in these areas show that locally available small mammals, particularly rabbits, were hunted in these lowland basins as well (Windmiller, 1973; O'Laughlin, 1980; Bayham, 1982, 1986; Szuter, 1986; Bostwick and Hatch, 1988; Dawson, 1993; James, 1993; Szuter and Bayham, 1996). Remains of large mammals are rare. It has been hypothesized that small social groups—perhaps 25 people or so—were typically occupying these short-term camps.

Higher elevation woodland communities are usually modeled to have seen their greatest use in the fall and perhaps winter months, when acorn and pine nut crops were available, large mammal hunting was productive,

and firewood was at hand (Wills, 1988a; Shackley, 1996). The few studies of Early and Middle Archaic sites in upland environments have usually not resulted in the recovery of plant or animal remains that could aid in assessing seasonality (Windmiller and Huckell, 1973; Baker, 1981; Broster and Harrill, 1983; Huckell, 1984; Banks and Branchard, 1994). In fact, the few archaeobotanical assemblages from woodland environments in northeastern Arizona (Parry *et al.*, 1994) and southeastern Utah (Coulam and Barnett, 1980; Barnett and Coulam, 1980) are very similar to ones from lowland communities. Moreover, at Sudden Shelter in southeastern Utah, there was no evidence of use of pinyon, despite its presence in the modern environment, and at Cowboy Cave pinyon was not evident in deposits older than 3500 B.P. Of course, it is also important to remember that the modern presence and relative abundance of pinyon pines and other taxa may not be a good guide to the Early and Middle Archaic resource distributions. In any case, use of upland environments may be more complex than some models propose, and visits during multiple seasons may have occurred.

Archaic overwintering strategies have also been discussed for various parts of the region. Wills (1988a) and M. Whalen (1994) suggest that overwintering may have occurred along permanent streams in the desert basins, perhaps at sites where pitstructures were built. However, prior to the appearance of significant investment in agriculture, even sites with structures do not show evidence of extended or intensive occupation, or use by large social groups (M. Whalen, 1994; Mauldin, 1996; Gilman *et al.*, 1996). Winter subsistence may have forced a greater focus on hunting, or some reliance on stored resources, or both. Preagricultural sites with structures are noteworthy for an absence or paucity of obvious storage pits, although Whalen (1994) notes that some recent Great Basin groups stored food at camps near where it was collected and not at winter residential sites. Thus, high levels of movement may still have occurred during the winter, with only short-term residence at any one place. Overwintering on the Colorado Plateau might have focused on pinyon-juniper communities, where firewood and stored pinenuts were available. Winter rockshelter occupations are documented for the northern Colorado Plateau (Schroedl and Coulam, 1994).

Estimates of the scale at which an annual round might operate have varied considerably among researchers. In many older models, the areas covered by an annual round of foraging have been assumed to consist of a basin and the adjacent, bounding mountain range or ranges (Wait, 1976, 1983; N. Whalen 1971, 1975; also see S. Fish *et al.*, 1990, 1992; Fish and Fish, 1991). Linear distances of less than 10–20 km of movement might be involved. More recently, suggestions that hunter-gatherers operated at far larger scales have been advanced, based on ecological grounds (Hard, 1986)

and reflected by exotic lithic raw material (Shackley, 1986, 1990, 1996; Vierra, 1990), such that movements across 200 or 300 km were considered probable. Ethnologically- and ecologically based theories would support such larger scales of movement. In contrast to highly mobile patterns of Archaic foraging, multiseasonal "sedentism" in particularly resource rich parts of the Sonoran Desert has been proposed (Fish *et al.*, 1990, 1992; Fish and Fish, 1991). High resource diversity, abundance, and accessibility are seen as the basis for this proposed preagricultural sedentism. No archaeological examples of such settlements are known, and questions of resource dependability in the face of climatic and biotic variation and apparent lack of storage technology have been posed (Huckell, 1995).

Change in Land Use

Attempts to evaluate changes in Archaic land use patterns are important. Usually a paucity of empirical data has forced the use of one general model, at least for the preagricultural part of the Archaic period. On the subregional level, it has been recognized that there is variation in Archaic presence through time, with some parts of the period being well-represented and others absent. Explanations of gaps in the record may involve short- or long-term changes in foraging territories (Binford, 1982) or even regional abandonments due to climatically based changes in resource availability during the Middle Holocene (Berry, 1982; Berry and Berry, 1986; Bayham and Morris, 1990; Geib, 1995).

Most models suggest limited or perhaps major changes in land use following the integration of agriculture into hunting-gathering economies as part of a pattern of intensification (Wills and Huckell, 1994; Wills, 1995). At a minimum, cultigens, especially maize, offered Archaic hunter-gatherers a new food source that was predictable in time and space, storable, potentially highly productive, and, to a large degree, under human control. Moreover, major investment in pit storage technology is apparent with the arrival of agriculture, suggesting that delayed return strategies were being employed to decrease spatial and temporal variation in food supply. Land use change, based on an increasing focus on localities where agriculture could be successfully pursued, is expectable. Investment of time and labor at a farming locality for the purposes of planting, tending, harvesting, and storing foodstuffs may in turn cause changes in where the winter and early spring seasons are spent and is likely to be associated with increased emphasis of the consumption of stored food reserves. Minnis (1985, 1992) and Wills (1988a) have argued that after 3000 B.P., reliance on cultivated plants facilitated longer and more intensive use of upland communities in west

central New Mexico. Huckell and Roth suggest multiseasonal residency at lowland riverine sites in southeastern Arizona beginning at this same time, part of a pattern of reduced residential mobility and possibly attendant shifts to logistical forms of mobility organization to procure wild resources in more distant biomes (Huckell 1988, 1990, 1995; Huckell *et al.*, 1994; Roth 1989, 1992, 1996). However, it is becoming increasingly apparent that the degree of agricultural dependence across the North American Southwest was highly variable during the Late Archaic/Early Agricultural period. In the Chihuahuan biotic province and northern Colorado Plateau no major changes in land use are detectable until the first millennium A.D. (M. Whalen, 1994; Mauldin, 1996; Geib, 1995); on the southern Colorado Plateau lower magnitude changes are suggested (Smiley, 1994). These are areas with lower agricultural potential and less dependable productivity of wild resources. Ford (1981, 1984), Minnis (1985, 1992), Wills (1988a), and Hogan (1994) have suggested that initial efforts at cultivation in the Mogollon Highlands and San Juan Basin may have been accommodated within the existing, preagricultural use of the landscape. With increasing commitment to farming, scheduling conflicts between wild resource procurement and cultivation forced people to alter either their use of the landscape or their mobility organization to solve temporal and spatial problems in resource distribution and acquisition.

Organization of Foraging

Ecologically- and ethnologically based theory has also served to frame inquiries into the organizational structure a society employed to obtain resources. Concerns with the organization of subsistence-settlement systems were initially manifested in the 1960s and 1970s by the classification of site types as a means to infer Archaic subsistence organization.

Site types were recognized by variation in site size, contents, position on the landscape, and artifact assemblage composition. An early focus in the Southwest was the attempt to explain variation in site size and content by reference to the kinds of activities that might have produced the record, and how those in turn permitted inferences about socioeconomic organization. Accordingly, emphasis was placed on recognizing different functional site types; Simmons and his colleagues (1989) have chronicled these efforts by researchers in the San Juan Basin of northwestern New Mexico. Although a primary emphasis was placed on differentiating habitation sites and special use sites, individual researchers identified from as few as two (the basic habitation-special use sites dichotomy) to as many as six site types based on the presence or absence of particular classes of

artifacts and features, site size and artifact density, or evident function. Chapman (1980) suggested that these often relied more on assumptions about Archaic foraging behavior than rigorous analysis.

Consideration of the cultural processes of site formation is of critical importance for site-based investigative approaches. Site size and assemblage contents were initially interpreted to simply mirror occupational intensity, functional diversity, or group size (Reher and Witter, 1977). However, subsequent researchers recognized that many of the larger habitation sites were the products of repeated use of favorable localities, potentially spanning several millennia (Chapman, 1980; Huckell, 1984; Elyea and Hogan, 1983; Vierra, 1994b). Conversely, smaller sites might reflect single-event occupations. In addition, excavation of sites not infrequently revealed the existence of subsurface features and greater diversity in classes or quantities of artifacts, making surface-based judgments of type questionable (Simmons, *et al.*, 1989; Moore, 1980; Miller, 1980; Eschman, 1983; Elyea and Hogan, 1983). In the absence of stratigraphic separation of components, efforts to understand the details of site function and occupation are liable to be not only fruitless but also misleading.

Recent years have also witnessed the development of landscape-based—as opposed to site-based—approaches to modeling land use patterns (Seaman *et al.*, 1988; Wandsnider and Ebert, 1988; Doleman, 1994). These approaches may allow broad-scale sampling of the archaeological record as it actually occurs, without the imposition of the often artificial "site" or "isolated occurrence" concepts to what is, in certain areas, a more or less continuous distribution of artifacts. Successful applications may yield greater insights into Archaic land use, if problems with chronological placement of remains can be solved (Hicks, 1994) and if the history of geomorphic processes that may have affected the preservation and exposure of the record are understood and controlled (Blair *et al.*, 1990).

Explanations for site location have often focused on the presence of or ease of access to a diversity of resources. For example, the vegetative diversity model (Reher and Witter, 1977) explained Archaic site location in northwestern New Mexico by ease of access to multiple plant communities. Later researchers have found fault with the model in both theoretical terms and empirical applications (Chapman, 1980). Toll and Cully (1994) suggested that a given locality might have been selected because of the seasonal abundance of one particular plant or resource. Also, in arid environments access to permanent or seasonal water may strongly dictate settlement location (Huckell, 1984; Vierra, 1994b). Less tangible factors, including topography and surface vegetative cover, probably also affected the choice of site location.

Intimately linked to the studies of site types were implicit ideas about the size and nature of the social units and organizational patterns that they might reflect. Larger habitation sites (home base camps) reflected larger social units such as macrobands, while smaller habitation sites (limited home base camps) represented microbands. Task-specific sites were posited to be the products of smaller social or functional divisions of social groups (Vierra, 1980). A very similar model has recently been proposed for the south-central portion of New Mexico (Anderson, 1993). As discussed above, the effects of episodic reuse of a particular locality over time may obscure evidence of residential group size.

Recent efforts to understand hunter-gatherer use of the landscape have targeted elucidation of socioeconomic mobility organization. The residential mobility (forager)-logistical mobility (collector) dichotomy of Binford (1980; also see Kelly, 1983) inspired several studies to recognize what attributes sites occupied by foragers and collectors might display (Kemrer, 1982; Vierra, 1994b; Vierra and Doleman, 1994). The archaeological manifestations of foragers might be sites of similar size and content, containing artifact assemblages with high diversity that reflect the pursuit of a broad, but relatively consistent, range of subsistence activities. Further, a relatively greater representation of exotic (nonlocal) raw materials might also be a signature of this pattern, assuming direct procurement of raw materials rather than trade. Sites left by collectors might be expected to display greater variability in terms of size and contents, less diverse artifact assemblages, and greater reliance on locally available raw materials.

In the northern Southwest, arguments have been made that throughout most of the Archaic period, forager subsistence-settlement systems held sway (Elyea and Hogan, 1983; Vierra, 1994b). However, an increasing logistic component might have been used in the winter, when hunting assumed greater importance and a winter base camp might be occupied for extended periods of time. The appearance of domestic structures at some Middle Archaic localities hints at occasionally longer stays in basins, but these sites often lack obvious storage features and seldom display high densities of occupational trash. Several researchers (Hogan, 1994; Vierra and Doleman, 1994) have also observed a shift in mobility organization during the later part of the Archaic period, after the arrival of cultigens. This is reflected by increased numbers and kinds of features, higher densities of artifacts, and use of predominantly local raw materials. The same pattern has been recognized in the southern Southwest (Huckell, 1988; Roth, 1992; Anderson, 1993) and has been suggested to result from decreased residential mobility associated with the reallocation of labor to agriculture. The presence of plant taxa in these sites from more distant biotic communities has been suggested to reflect use of logistic mobility to

procure those resources (Huckell, 1988, 1990, 1995; Roth, 1989, 1992, 1996). There is good evidence of specialized resource procurement and processing sites located away from lower elevation habitation sites, although it is not clear what kinds of social units utilized them (N. Whalen, 1971; Roth, 1992; Phillips *et al.*, 1993). An accompanying change is increased preferential hunting of large mammals (Bayham, 1982; Szuter and Bayham, 1989, 1996; Speth and Scott, 1989; Huckell, 1995). Thus, with the Early Agricultural period, there is evidence of reorganization of subsistence-settlement systems.

CONCLUSIONS

It is safe to say that after more than 50 years, we are still just beginning to know the Archaic prehistory of the North American Southwest. This overview has been an admittedly coarse-grained look that doubtless oversimplifies the regional and subregional complexities of time, adaptation, and culture. On a more positive note, data are accumulating at a pace unimaginable only a decade ago, and as might be expected when one is attempting to sample so vast an area and so long a span of time, today's ideas and understandings are routinely being cast aside and rewritten in the face of new information. The discovery that changes of far greater magnitude and more profound character followed the arrival of agriculture in the region is probably the most obvious example. At the same time, it should give us pause for thought when the excellent records from two rockshelters at the far northern edge of the North American Southwest can play such a dominant role in reconstructions of the Early and Middle Archaic periods of the region.

The tremendous volume of contract archaeology done on Archaic sites in the southwestern United States over the past 25 years has, perhaps, repaid some our nation's investment in the protection of its cultural resources. Surely without that effort we would lack many of the studies that can be brought to bear on the reconstruction of Archaic prehistory. Moreover, methodological advancement and problem orientation owe much to contract research. The value of these contributions is somewhat marred by problems of access to the "gray" literature in which most of these studies are published. University- or museum-based research continues but contributes a markely lesser volume of information. Nevertheless, academic institutions have the freedom to focus their activities on sites with high research potential, independent of the arbitrary boundaries of landmodifying development projects. Both realms are complementary and beneficial to knowledge, and greater communication between researchers

in the two should be a high priority. Our knowledge of the Archaic cultures in northern Mexico is woefully incomplete, a situation that merits cooperative action between the archaeologists of both nations.

Tasks for the future must have, as a top priority, the focus of maximum investigative attention on sites with contextual integrity and good preservation. It is from them that the highest quality information can be gained, and as should be obvious from the preceding pages, such sites are critical for understanding the details of Archaic prehistory. Landscape-based approaches, well grounded in understanding of the cultural and geomorphic processes that have conditioned the archaeological record, should also be improved. There are also specific gaps or weaknesses in our knowledge of Archaic adaptive systems that need to be filled. Two prominent examples are the age, origin, and nature of the earliest Archaic cultures and documentation of late Middle Archaic subsistence-settlement systems at and immediately prior to the arrival of agriculture. Another challenge is to integrate the emerging records of early and middle Holocene climate and environment with models of Archaic hunter-gatherer land use. We also need to refine our understanding of projectile points as tools for cultural, temporal, and behavioral inference. Finally, as Irwin-Williams admonished 30 years ago, our analytical approaches must remain flexible and capable of treating and integrating data at both fine-scale and broad brush levels. As with a good book of many chapters, even though we have barely started the story, there is much to anticipate as our research into the Archaic of the North American Southwest progresses.

ACKNOWLEDGMENTS

Trying to cover several thousand years and millions of square kilometers is not an easy task, and I am indebted to a number of people for their aid in preparing this overview. First, my appreciation goes to Angela Close for the opportunity to take on this task; her patience with me over delays caused by a major change in employment and new responsibilities was nearly endless. My appreciation also goes to Phil Geib, Pat Hogan, Chip Wills, David Gregory, Jonathan Mabry, and three anonymous reviewers for their thoughtful reading and consideration of the draft. I hope that the resulting changes have made this a better paper. Special thanks go to Matt Schmader for permission to illustrate one of his recently excavated Middle Archaic structures near Albuquerque, and to Jonathan Mabry for consent to illustrate the Cienega phase structure from the Santa Cruz Bend site. Also, thanks to Art McWilliams for information on the Archaic period in Chihuahua and to Henry Wallace for sharing his knowledge of Archaic

rock art. Lisa Huckell not only provided a critical reading of this overview, but has been a very special supporter and enthusiastic collaborator on many Archaic sites over the years. Finally, my deepest thanks go to the numerous people who have shared ideas and information over the years and have helped to shape my views of the Archaic period in the North American Southwest. While my views may not mirror theirs, I am indebted to them for their collegiality and friendship.

REFERENCES

Agenbroad, L. D. (1970). *Cultural Implications from the Statistical Analysis of a Prehistoric Lithic Site in Arizona,* Master's thesis, University of Arizona, Tuscon.

Agogino, G. A. (1960). The San Jose sites: A Cochise-like manifestation in the middle Rio Grande. *Southwestern Lore* **26**: 43–48.

Agogino, G. A., and Hester, J. H. (1953). The Santa Ana pre-ceramic sites. *El Palacio* **60**: 131–140.

Agogino, G. A., and Hester, J. H. (1956). A reevaluation of the San Jose non-ceramic cultures. *El Palacio* **63**: 6–21.

Alexander, H. G., and Reiter, P. (1935). Report on the Excavation of Jemez Cave, New Mexico. *School of American Research Monograph* 4, University of New Mexico, Albuquerque, and School of American Research, Santa Fe.

Alvarez P., A. M., Echavarri P., A., Escarcega E., J. A., Montane M., J. C., Perez B., R. G., Villalpando C., M. E., and Vivas, G. (1985). *Historia General de Sonora, I, Periodo Prehistorico y Prehispanico,* Gobierno del Estado de Sonora, Hermosillo.

Anderson, S. (1993). Archaic period land use in the southern Tularosa Basin, New Mexico. In MacNeish, R. S. (ed.), Preliminary Investigations of the Archaic in the Region of Las Cruces, New Mexico. *Historic and Natural Resources Report* 9, Cultural Resources Management Program, Directorate of the Environment, United States Army Air Defense Artillery Center, Fort Bliss, TX, pp. 48–67.

Antevs, E. (1941). Age of the Cochise Culture stages. In Sayles, E. B., and Antevs, E. (eds.), The Cochise Culture, *Medallion Papers* 29, Gila Pueblo, Globe, AZ, pp. 31–55.

Antevs, E. (1955). Geologic-climatic dating in the west. *American Antiquity* **20**: 317–355.

Antevs, E. (1983). Geological dating. In Sayles, E. B. (ed.), The Cochise Cultural Sequence in Southeastern Arizona. *Anthropological Papers of the University of Arizona* 42, University of Arizona Press, Tucson, pp. 26–43.

Bahre, C. J. (1990). *A Legacy of Change: Historic Human Impact on Vegetation in the Arizona Borderlands,* University of Arizona Press, Tucson.

Baker, C. (1981). Archaic culture phenomena. In Baker, C., and Winter, J. C. (eds.), *High Altitude Adaptations Along Redondo Creek,* Office of Contract Archeology, University of New Mexico, Albuquerque, pp. 163–172.

Banks, K. M., and Branchard, W. R. (1994). Hunter-gatherer adaptations in the Navajo Nation Forest. In Vierra, B. J. (ed.), Archaic Hunter-Gatherer Archaeology in the American Southwest, *Contributions in Anthropology* 13(1), Eastern New Mexico University, Portales, pp. 291–334.

Barnett, P. R., and Coulam, N. J. (1980). Plant macrofossil analysis. In Jennings, J. D. (ed.), Cowboy Cave, *University of Utah Anthropological Papers* 104, University of Utah Press, Salt Lake City, pp. 127–134.

Bayham, F. E. (1982). *A Diachronic Analysis of Prehistoric Animal Exploitation at Ventana Cave.* Ph.D. dissertation, Arizona State University, Tempe.

Bayham, F. E. (1986). Middle Archaic animal utilization in south-central Arizona. In Bayham, F. E., Morris, D. H., and Shackley, M. S. (eds.), Prehistoric Hunter-Gatherers of South

Central Arizona: The Picacho Reservoir Project, *Anthropological Field Studies* 13, Office of Cultural Resource Management, Department of Anthropology, Arizona State University, Tempe, pp. 315–340.
Bayham, F. E., and Morris, D. H. (1990). Thermal maxima and episodic occupation of the Picacho Reservoir dune field. In Minnis, P. E., and Redman, C. L. (eds.), *Perspectives on Southern Prehistory.* Westview Press, Boulder, pp. 26–37.
Bayham, F. E., Morris, D. H., and Shackley, M. S. (1986). Prehistoric Hunter-Gatherers of South Central Arizona: The Picacho Reservoir Archaic Project. *Anthropological Field Studies* 13, Office of Cultural Resource Management, Department of Anthropology, Arizona State University, Tempe.
Beckett, P. H. (1980). The Ake Site: Collection and Excavation of LA 13423, Catron County, New Mexico. *Cultural Resources Management Division Report* 357, Department of Sociology and Anthropology, New Mexico State University, Las Cruces.
Berry, C. F. (1984). A description of lithic collections from the Railroad and Transmission Line Corridors. *Museum of Northern Arizona Research Paper* 29, *Coronado Project Archaeological Investigations Series* 6, Museum of Northern Arizona Press, Flagstaff.
Berry, C. F., and Berry, M. S. (1986). Chronological and conceptual models of the Southwestern Archaic. In Condie, C. J., and Fowler, D. D. (eds.), Anthropology of the Desert West: Essays in Honor of Jesse D. Jennings, *University of Utah Anthropological Papers* 110, University of Utah Press, Salt Lake City, pp. 253–327.
Berry, M. S. (1982). *Time, Space, and Transition in Anasazi Prehistory,* University of Utah Press, Salt Lake City.
Berry, M. S. (1985). The age of maize in the greater Southwest: A critical review. In Ford, R. I. (ed.), Prehistoric Food Production in North America. *Museum of Anthropology, Anthropological Papers* 75, University of Michigan, Ann Arbor, pp. 279–307.
Betancourt, J. L. (1990). Late Quaternary biogeography of the Colorado Plateau. In Betancourt, J. L., VanDevender, T. R., and Martin, P. S. (eds.), *Packrat Middens,* University of Arizona Press, Tucson, pp. 259–292.
Betancourt, J. L., Van Devender, T. R., and Martin, P. S. (eds.) (1990). *Packrat Middens, the Last 40,000 Years of Biotic Changes,* University of Arizona Press, Tucson.
Bettinger, R. L. (1991). *Hunter-Gatherers, Archaeological and Evolutionary Theory,* Plenum Press, New York.
Bettinger, R. L., O'Connell, J. F., and Thomas, D. H. (1991). Projectile points as time markers in the Great Basin. *American Anthropologist* **93**: 166–172.
Binford, L. R. (1980). Willow smoke and dogs' tails: Hunter-gatherer settlement systems and archaeological site formation. *American Antiquity* **45**: 4–20.
Binford, L. R. (1982). The archaeology of place. *Journal of Anthropological Archaeology* **1**: 5–31.
Blair, T. C., Clark, J. S., and Wells, S. G. (1990). Quaternary continental stratigraphy, landscape evolution, and application to archeology: Jarilla piedmont and Tularosa graben floor, White Sands Missile Range, New Mexico. *Geological Society of America Bulletin* **102**: 749–759.
Bluhm, E. (1952). Clothing and textiles. In Martin, P. S., Rinaldo, J. B., Bluhm, E., Cutler, H. C., and Grange, R., Jr. (eds.), Cultural Continuity and Change: The Stratigraphic Analysis of Tularosa and Cordova Caves, *Fieldiana: Anthropology* 40, Chicago Natural History Museum, Chicago, pp. 231–330.
Bluhm, E., and Grange, R., Jr. (1952). Cordage, knots, and cordage artifacts. In Martin, P. S., Rinaldo, J. B., Bluhm, E., Cutler, H. C., and Grange, R., Jr. (eds.), Cultural Continuity and Change: The Stratigraphic Analysis of Tularosa and Cordova Caves, *Fieldiana: Anthropology* 40, Chicago Natural History Museum, Chicago, pp. 205–230.
Bostwick, T. W. (assembler) (1988). *An Investigation of Archaic Subsistence and Settlement in the Harquahala Valley, Maricopa County, Arizona.* Northland Research, Flagstaff.
Bostwick, T. W., and Hatch, P. (1988). Faunal analysis. In Bostwick, T. (assembler), *An Investigation of Archaic Subsistence and Settlement in the Harquahala Valley, Maricopa County, Arizona,* Northland Research, Flagstaff, pp. 294–310.

Bostwick, T. W., and Stone, C. L. (1988). Hunters, gatherers, and farmers in the Harquahala Valley: Summary and conclusions of the HVID Project. In Bostwick, T. W. (assembler), *An Investigation of Archaic Subsistence and Settlement in the Harquahala Valley, Maricopa County, Arizona*, Northland Research, Flagstaff, pp. 320–355.

Broster, J. B., and Harrill, B. G. (1983). Investigations of prehistoric remains at high-altitudes in the Sacramento Mountains of south-central New Mexico. In Winter, J. C. (ed.), High Altitude Adaptations in the Southwest, *Cultural Resources Management Report* 2, USDA Forest Service, Southwestern Region, pp. 159–167.

Brown, D. E. (ed.) (1982a). Biotic communities of the American Southwest—United States and Mexico. *Desert Plants* 4.

Bryan, K., and Toulouse, J. H. (1943). The San Jose non-ceramic culture and its relation to a puebloan culture in New Mexico. *American Antiquity* 8: 269–280.

Burton, J. F., and Farrell, M. M. (1993). Projectile points. In Burton, J. F. (eds.), Days in the Painted Desert and the Petrified Forests of Northern Arizona, Contributions to the Archeology of Petrified Forest National Park, 1988-1992, *Publications in Anthropology* 62, Western Archeological and Conservation Center, National Park Service, Tucson, pp. 125–145.

Byers, D. R. (1959). An introduction to five papers on the Archaic Stage. *American Antiquity* 24: 229–232.

Campbell, E. W. C., and Campbell, W. H. (1935). The Pinto Basin Site. *Southwest Museum Papers* 9, Southwest Museum, Los Angeles.

Campbell, E. W. C., Campbell, W. H., Antevs, E., Amsden, C. A., Barbieri, J. A., and Bode, F. D. (1937). The Archeology of Pleistocene Lake Mohave. *Southwest Museum Papers* 11, Southwest Museum, Los Angeles.

Campbell, J. M., and Ellis, F. H. (1952). The Atrisco sites: Cochise manifestations in the middle Rio Grande Valley. *American Antiquity* 17: 211–221.

Carmichael, D. L. (1986). Archaeological survey in the southern Tularosa Basin of New Mexico. *Historic and Natural Resources Report* 3, Environmental Management Office, Directorate of Engineering and Housing, United States Army Air Defense Artillery Center, Fort Bliss, TX.

Chapman, R. C. (1977). Analysis of the lithic assemblages. In Reher, C. A. (ed.), *Settlement and Subsistence Along the Lower Chaco River, The CGP Survey*, University of New Mexico Press, Albuquerque, pp. 371–452.

Chapman, R. C. (1980). *The Archaic Period in the American Southwest: Facts and Fantasy*, Ph.D. dissertation, University of New Mexico, Albuquerque.

COHMAP Members (1988). Climatic changes of the last 18,000 years: Observations and model simulations. *Science* 241: 1043–1052.

Cole, S. J. (1990). *Legacy on Stone, Rock Art of the Colorado Plateau and Four Corners Region*, Johnson Books, Boulder, CO.

Cole, S. J. (1994) Roots of Anasazi and Pueblo imagery in Basketmaker II rock art and material culture. *The Kiva* 60: 289–312.

Cordell, L. S. (1984). *Prehistory of the Southwest*, Academic Press, San Diego.

Cosgrove, C. B. (1947) Caves of the Upper Gila and Hueco Areas in New Mexico and Texas. *Papers of the Peabody Museum of American Archaeology and Ethnology* 24(2).

Coulam, N. J., and Barnett, P. R. (1980). Paleoethnobotanical analysis. In Jennings, J. D., Schroedl, A. R., and Holmer, R. N. (eds.), Sudden Shelter, *University of Utah Anthropological Paper* 103, University of Utah Press, Salt Lake City, pp. 171–195.

Crown, P. C., and Wills, W. H. (1995). The origins of Southwestern ceramic containers: Women's time allocation and economic intensification. *Journal of Anthropological Research* 51: 173–186.

Dart, A. (1986). Archaeological Investigations at La Paloma: Archaic and Hohokam Occupations at Three Sites in the Northeastern Tucson Basin, Arizona. *Institute for American Research Anthropological Papers* 4, Institute for American Research, Tucson.

Dart, A. (1989). The Gunsight Mountain archaeological survey: Archaeological sites in the northern Sierrita Mountains near the junction of the Altar and Avra valleys southwest

of Tucson, Arizona. *Center for Desert Archaeology Technical Report* 89-1, Center for Desert Archaeology, Tucson.

D'Avezedo, W. L. (ed.) (1986). Great Basin. *Handbook of North American Indians* 11, Smithsonian Institution, Washington, DC.

Davis, C. A., and Smith, G. A. (1981). *Newberry Cave*, San Bernardino County Museum Association, Redlands, CA.

Davis, E. L. (1963). The Desert Culture of the western Great Basin: A lifeway of seasonal transhumance. *American Antiquity* **29**: 202–212.

Dawson, P. (1993). Faunal remains from Todsen Cave. In MacNeish, R.S. (ed.), Preliminary Investigations of the Archaic in the Region of Las Cruces, New Mexico. *Historic and Natural Resources Report* 9, Cultural Resources Management Program, Directorate of the Environment, United States Army Air Defense Artillery Center, Fort Bliss, TX, pp. 68–104.

Dean, J. S., Euler, R. C., Gumerman, G. J., Plog, F., Hevly, R. H., and Karlstrom, T. N. V. (1985). Human behavior, demography, and paleoenvironment on the Colorado Plateaus. *American Antiquity* **50**: 537–554.

Del Bene, T. A., and Ford, D. (1982). Archaeological excavations in Blocks VI and VII, Navajo Indian Irrigation Project, San Juan County, New Mexico. *Navajo Nation Papers in Anthropology* 13, Navajo Tribal Cultural Resource Management Program, Window Rock, AZ.

Dick, H. W. (1965). Bat Cave. *The School of American Research Monograph* 27, School of American Research, Santa Fe.

Dohm, K. M. (1994). The search for Anasazi village origins: Basketmaker II dwelling aggregation on Cedar Mesa. *The Kiva* **60**: 257–276.

Doleman, W. H. (1994). Sites, sampling and cultural landscapes: Problems in defining assemblages for analysis. In Vierra, B. J. (ed.), Archaic Hunter-Gatherer Archaeology in the American Southwest. *Eastern New Mexico University Contributions in Anthropology* 13(1), Eastern New Mexico University, Portales, pp. 405–455.

Doolittle, W. E. (1988) Pre-Hispanic Occupance of in the Valley of Sonora, Mexico. Arechaeological Confirmation of Early Spanish Reports. *Anthropological Papers of the University of Arizona* 48. University of Arizona Press, Tucson.

Dosh, S. G., Ciolek-Torrello, R., and Taylor, C. (1987). Analysis of chipped stone assemblages. In Ciolek-Torrello, R. (ed.), Archaeology of the Mazatzal Piedmont, Central Arizona. *Museum of Northern Arizona Research Paper* 33, Vol. 1, Museum of Northern Arizona, Flagstaff, pp. 115–164.

Eddy, F. W. (1958). *Sequence of Cultural and Alluvial Deposits in the Cienega Creek Basin, Southeastern Arizona*, Master's thesis, University of Arizona, Tucson.

Eddy, F. W. (1961). Excavations at Los Pinos phase sites in the Navajo Reservoir District. *Museum of New Mexico Papers in Anthropology* 4, Museum of New Mexico, Santa Fe.

Eddy, F. W., and Cooley, M. E. (1983). Cultural and Environmental History of Cienega Valley, Southeastern Arizona. *University of Arizona Anthropological Papers* 43, University of Arizona Press, Tucson.

Eidenbach, P. L. (ed.) (1983). *The Prehistory of Rhodes Canyon, N.M.*, Human Systems Research, Tularosa, NM.

Elyea, J. M., and Hogan, P. (1983). Regional interaction: The Archaic adaptation. In Hogan, P., and Winter, J. C. (eds.), *Economy and Interaction along the Lower Chaco River*, Office of Contract Archeology and Maxwell Museum of Anthropology, University of New Mexico, Albuquerque, pp. 393–402.

Emslie, S. D., Euler, R. C., and Mead, J. I. (1987). A Desert Culture shrine in Grand Canyon, Arizona, and the role of split-twig figurines. *National Geographic Research* 3: 511–516.

Eschman, P. N. (1983). Archaic site typology and chronology. In Hogan, P., and Winter, J. C. (eds.), *Economy and Interaction Along the Lower Chaco River*, Office of Contract Archeology and Maxwell Museum of Anthropology, University of New Mexico, Albuquerque, pp. 375–384.

Euler, R. C. (ed.) (1984). The Archaeology, Geology, and Paleobiology of Stanton's Cave, Grand Canyon National Park, Arizona. *Monograph* 6, Grand Canyon Natural History Association.

Ezell, P. H. (1954). An archaeological survey of northwestern Papagueria. *The Kiva* **19**: 1–26.

Fay, G. E. (1967). An Archaeological Study of the Peralta Complex in Sonora, Mexico. *Occasional Publications in Anthropology, Archaeology Series* 1, Department of Anthropology, Colorado State College, Greeley.

Figgins, J. D. (1927). The antiquity of man in America. *Natural History* **27**: 229–239.

Fish, P. R., and Fish, S. K. (1991). Comparative paradigms for the Neolithic transition in the Levant and the American Southwest. In Clark, G. A. (ed.), *Perspectives on the Past, Theoretical Biases in Mediterranean Hunter-Gatherer Research,* University of Pennsylvania Press, Philadelphia, pp. 396–410.

Fish, P. R., Fish, S. K., Long, A., and Miksicek, C. H. (1986). Early corn remains from Tumamoc Hill, southern Arizona. *American Antiquity* **51**: 563–572.

Fish, S. K., Fish, P. R., and Madsen, J. H. (1990). Sedentism and mobility in the Tucson Basin prior to A.D. 1000. In Minnis, P. E., and Redman, C. L. (eds.), *Perspectives on Southwestern Prehistory,* Westview Press, Boulder, CO, pp. 76–163.

Fish, S. K., Fish, P. R., and Madsen, J. H. (1992). Early sedentism and agriculture in the northern Tucson Basin. In Fish, S. K, Fish, P. R., and Madsen, J. H. (eds.), The Marana Community in the Hohokam World, *Anthropological Papers of the University of Arizona* 56, University of Arizona Press, Tucson, pp. 11–19.

Flenniken, J. J., and Wilke, P. J. (1989). Typology, technology, and chronology of Great Basin dart points. *American Anthropologist* **91**: 149–158.

Ford, R. I. (1975). Re-excavation of Jemez Cave, New Mexico. *Awanyu* **3**: 13–27.

Ford, R. I. (1981). Gardening and farming before A.D. 1000: Patterns of prehistoric cultivation north of Mexico. *Journal of Ethnobiology* **1**: 6–27.

Ford, R. I. (1984). Ecological consequences of early agriculture in the Southwest. In Plog, S., and Powell, S. (eds.), *Papers on the Archaeology of Black Mesa, Arizona, Vol. 2,* Southern Illinois University Press, Carbondale, pp. 127–138.

Formby, D. E. (1986). Pinto-Gypsum complex projectile points from Arizona and New Mexico. *The Kiva* **51**: 99–127.

Frison, G. C. (1991). *Prehistoric Hunters of the High Plains,* 2nd ed., Academic Press, San Diego.

Galinat, W. C. (1988). The origin of Maiz de Ocho. *American Anthropologist* **90**: 682–683.

Geib, P. R. (1995). Radiocarbon record for Archaic occupation of the central Colorado Plateau. In van Ripper, C., III (ed.), Proceedings of the Second Biennial Conference on Research in Colorado Plateau National Parks. *Transactions and Proceedings Series NPS/NRNAU/NRTP-95/11,* United States Department of the Interior, National Park Service, pp. 89–136.

Geib, P. R., and Ambler, J. R. (1991). Sand Dune Side-Notched: An Early Archaic projectile point type of the northern Colorado Plateau. *Utah Archaeology* **4**: 17–23.

Geib, P. R., and Davidson, D. (1994). Anasazi origins: A perspective from preliminary work at Old Man Cave. *The Kiva* **60**: 191–202.

Gilman, P., Powell, V. S., and Dycus, D. L. (1996). The Role of Agriculture and Residential Movement in the Late Archaic and Early Pit Structure Periods of Southeastern Arizona. In Roth, B. J. (ed.), Early Formative Adaptations in the Southern Southwest. *Monographs in World Archaeology* 25, Prehistory Press, Madison, pp. 73–84.

Gilpin, D. (1994). Lukachukai and Salina Springs: Late Archaic/Early Basketmaker habitation sites in the Chinle Valley, northeastern Arizona. *The Kiva* **60**: 203–218.

Grange, R., Jr. (1952). Wooden artifacts. In Martin, P. S., Rinaldo, J. B., Bluhm, E., Cutler, H. C., and Grange, R., Jr. (eds.), Cultural Continuity and Change: The Stratigraphic Analysis of Tularosa and Cordova Caves, *Fieldiana: Anthropology* 40, Chicago Natural History Museum, Chicago, pp. 331–451.

Grayson, D. K. (1993). *The Desert's Past, a Natural Prehistory of the Great Basin,* Smithsonian Institution Press, Washington, DC.

Guernsey, S. J. (1931). Explorations in Northeastern Arizona. *Papers of the Peabody Museum of American Archaeology and Ethnology* **12**(1), Cambridge, MA.

Guernsey, S. J., and Kidder, A. V. (1921). Basket-Maker Caves of Northeastern Arizona. *Papers of the Peabody Museum of American Archaeology and Ethnology* 8(2), Cambridge, MA.

Gumerman, G. J. (1966). Two Basketmaker II pithouse villages in eastern Arizona: A preliminary report. *Plateau* 39: 80–87.

Halbirt, C. D., and Henderson, T. K. (eds.) (1993). *Archaic Occupation on the Santa Cruz Flats: The Tator Hills Archaeological Project*, Northland Research, Flagstaff.

Hall, S. A. (1985). Quaternary pollen analysis and vegetational history of the Southwest. In Bryant, V. M., Jr., and Holloway, R. G. (eds.), *Pollen Records of Late-Quaternary North American Sediments*, American Association of Stratigraphic Palynologists Foundation, Dallas, pp. 95–123.

Hard, R. J. (1986). *Ecological Relationships Affecting the Rise of Farming Economies: A Test from the American Southwest*, Ph.D. dissertation, University of New Mexico, Albuquerque.

Harrington, M. R. (1933). Gypsum Cave, Nevada. *Southwest Museum Papers* 8, Southwest Museum, Los Angeles.

Hastings, J. R., and Turner, R. M. (1965). *The Changing Mile*, University of Arizona Press, Tucson.

Haury, E. W. (1950). *The Stratigraphy and Archaeology of Ventana Cave*, University of Arizona Press, Tucson, and University of New Mexico Press, Albuquerque.

Haury, E. W. (1957). An alluvial site on the San Carlos Indian Reservation. *American Antiquity* 23: 2–27.

Haury, E. W. (1962). The Greater American Southwest. In Braidwood, R. J., and Willey, G. R. (eds.), *Courses Toward Urban Life*, Aldine, Chicago, pp. 106–131.

Haury, E. W., and Hayden, J. D. (1975). Preface 1975. In Haury, E. W. (ed.), *The Stratigraphy and Archaeology of Ventana Cave* (2nd printing), University of Arizona Press, Tucson, pp. v–vi.

Hayden, J. D. (1967). A summary prehistory of the Sierra Pinacate, Sonora. *American Antiquity* 32: 335–344.

Hayden, J. D. (1976). Pre-Altithermal archaeology in the Sierra Pinacate, Sonora. *American Antiquity* 41: 274–289.

Haynes, C. V. (1955). Evidence of early man in Torrance County, New Mexico. *Bulletin of the Texas Archeological Society* 26: 144–164.

Haynes, C. V. (1982). Archaeological investigations at the Lehner Site, Arizona. *National Geographic Society Research Reports* 14: 325–334.

Haynes, C. V. (1987). Curry Draw, Cochise County, Arizona: A late Quaternary stratigraphic record of Pleistocene extinction and Paleo-Indian activities. In *Geological Society of America Centennial Field Guide, Cordilleran Section*, Geological Society of America, Tucson, pp. 23–28.

Hewitt, N. J. (1980). Fiber artifacts. In Jennings, J. D. (ed.), Cowboy Cave. *University of Utah Anthropological Papers* 104, University of Utah Press, Salt Lake City, pp. 49–74.

Hicks, P. A. (1988). Results of analysis: Lithics. In Ravesloot, J. C. (ed.), *Archaeological Resources of the Santa Teresa Study Area, South-Central New Mexico*, Cultural Resource Management Division, Arizona State Museum, University of Arizona, Tucson.

Hicks, P. A. (1994). Dating the undiagnostic lithic scatter through the use of patterned changes in debitage attributes. In Vierra, B. J. (ed.), Archaic Hunter-Gatherer in the Americn Southwest. *Eastern New Mexico University Contribution in Anthropology* 13(1), Eastern New Mexico University, Portales, pp. 478–526.

Hogan, P. (1994). Foragers to farmers II: A second look at the adoption of agriculture in the northern Southwest, In Vierra, B. J. (ed.), Archaic Hunter-Gatherer Archaeology in the American Southwest. *Eastern New Mexico University Contributions in Anthropology* 13(1), Eastern New Mexico University, Portales, pp. 155–184.

Holliday, V. T. (1989). Middle Holocene drought on the southern High Plains. *Quaternary Research* 31: 74–82.

Holmer, R. N. (1980a). Projectile points. In Jennings, J. D., Schroedl, A. R., and Holmer, R. N. (eds.), Sudden Shelter. *University of Utah Anthropological Papers* 103. University of Utah Press, Salt Lake City, pp. 63–83.

Holmer, R. N. (1980b). Chipped stone projectile points. In Jennings, J. D. (ed.), Cowboy Cave. *University of Utah Anthropological Papers* 104, University of Utah Press, Salt Lake City, pp. 31–38.

Holmer, R. N. (1986). Common projectile points of the intermountain West. In Condie, C. J., and Fowler, D. D. (eds.), Anthropology of the Desert West, Essays in Honor of Jesse D. Jennings. *University of Utah Anthropological Papers* 110, University of Utah Press, Salt Lake City, pp. 89–115.

Honea, K. (1969). The Rio Grande Complex and the northern Plains. *Plains Anthropologist* **14**: 57–70.

Howard, E. B. (1935). Evidence of early man in North America. *The Museum Journal* **24**: 61–175.

Huckell, B. B. (1973). The Gold Gulch Site. *The Kiva* **39**: 105–129.

Huckell, B. B. (1977). The Hastqin site: A multicomponent site near Ganado, Arizona. *Arizona State Museum Contribution to Highway Salvage Archaeology in Arizona* 61, University of Arizona, Tucson.

Huckell, B. B. (1978). The Oxbow Hill-Payson Project. *Arizona State Museum Contribution to Highway Salvage Archaeology in Arizona* 48, University of Arizona, Tucson.

Huckell, B. B. (1984). The Archaic Occupation of the Rosemont Area, Northern Santa Rita Mountains, Southeastern Arizona. *Archaeological Series* 147(1), Arizona State Museum, University of Arizona, Tucson.

Huckell, B. B. (1988). Late Archaic archaeology of the Tucson Basin: A status report. In Doelle, W. H., and Fish, P. R. (eds.), Recent Research on Tucson Basin Prehistory: Proceedings of the Second Tucson Basin Conference. *Institute for American Research Anthropological Papers* 10, Institute for American Research, Tucson, pp. 57–80.

Huckell, B. B. (1990). *Late Preceramic Farmer-Foragers in Southeastern Arizona: A Cultural and Ecological Consideration of the Spread of Agriculture into the Arid Southwestern United States.* Ph.D. dissertation, University of Arizona, Tucson.

Huckell, B. B. (1995). Of Marshes and Maize: Preceramic Agricultural Settlements in the Cienega Valley, Southeastern Arizona. *Anthropological Papers of the University of Arizona* 59, University of Arizona Press, Tucson.

Huckell, B. B. (1996). Middle to late Holocene stream behavior and the transition to agriculture in southeastern Arizona. In Roth, B. J. (ed.), Early Formative Adaptations in the Southern Southwest. *Monographs in World Archaeology* 25, Prehistory Press, Madison, WI, pp. 27–36.

Huckell, B. B. and Haynes, C. V. (1995). The Ventana Complex: New dates and new ideas on its place in early Holocene Western prehistory. Paper presented at the 60th Annual Meeting of the Society for American Archaeology, Minneapolis, MN.

Huckell, B. B., Huckell, L. W., and Fish, S. K. (1994). Investigations at Milagro, a Late Preceramic Site in the Eastern Tucson Basin. *Technical Report* 94-5, Center for Desert Archaeology, Tucson.

Huckell, L. W. (1994). Paleoethnobotanical analysis. In Huckell, B. B., Huckell, L. W., and Fish, S. K. (eds.), Investigations at Milagro, a Late Preceramic Site in the Eastern Tucson Basin. *Technical Report* 94-5, Center for Desert Archaeology, Tucson, pp. 33–40.

Huckell, L. W. (1995). Farming and Foraging in the Cienega Valley: Early Agricultural Period Paleoethnobotany. In Huckell, B. B. (ed.), Of Marshes and Maize, Preceramic Agricultural Settlements in the Cienega Valley, Southeastern Arizona. *Anthropological Papers of the University of Arizona* 59, University of Arizona Press, Tucson, pp. 74–97.

Humphrey, R. R. (1987). *90 Years and 535 Miles, Vegetation Changes Along the Mexican Border,* University of New Mexico Press, Albuquerque.

Hunt, A. P., and Tanner, D. (1960). Early man sites near Moab, Utah. *American Antiquity* **26**: 110–117.

Hunt, C. B. (1983). Physiographic Overview of Our Arid Lands in the Western U.S. In Wells, S. G., and Haragan, D. R. (eds.), *Origin and Evolution of Deserts,* University of New Mexico, Albuquerque, pp. 7–63.

Hunter-Anderson, R. L. (1986). *Prehistoric Adaptation in the American Southwest*, Cambridge University Press, Cambridge.
Irwin-Williams, C. (1967). Picosa: The elementary Southwestern culture. *American Antiquity* 32(4): 441–457.
Irwin-Williams, C. (1968a). The reconstruction of Archaic culture in the southwestern United States. In Irwin-Williams, C. (ed.), Archaic Prehistory in the Western United States. *Eastern New Mexico University Contributions in Anthropology* 1(3), Eastern New Mexico University, Paleo Indian Institute, Portales, pp. 19–23.
Irwin-Williams, C. (1968b). Archaic Culture History in the Southwestern United States. In Irwin-Williams, C. (ed.), Early Man in Western North America. *Eastern New Mexico University Contributions in Anthropology* 1(4), Eastern New Mexico University, Paleo Indian Institute, Portales, pp. 48–54.
Irwin-Williams, C. (1973). The Oshara Tradition: Origins of Anasazi Culture. *Eastern New Mexico University Contributions in Anthropology* 5(1), Eastern New Mexico University, Paleo Indian Institute, Portales.
Irwin-Williams, C. (1979). Post-Pleistocene Archeology, 7000-2000 B.C. In Ortiz, A. (ed.), *Handbook on North American Indians, Southwest*, Vol. 9, Smithsonian Institution, Washington, DC, pp. 31–42.
Irwin-William, C., and Haynes, C. V. (1970). Climatic change and early population dynamics in the southwestern United States. *Quaternary Research* 1: 59–71.
Irwin-Williams, C., and Tomkins, S. (1968). Excavations at En Medio Shelter, New Mexico. *Eastern New Mexico University Contributions in Anthropology* 1(2), Eastern New Mexico University, Paleo-Indian Institute, Portales.
James, S. R. (1993). Archaeofaunal Analysis of the Tator Hills Sites, South-Central Arizona. In Halbirt, C. D., and Henderson, T. K. (eds.), *Archaic Occupation on the Santa Cruz Flats: The Tator Hills Archaeological Project*, Northland Research, Flagstaff, pp. 345–371.
Janetski, J. C. (1980). Wooden and reed artifacts. In Jennings, J. D. (ed.), Cowboy Cave, *University of Utah Anthropological Papers* 104, University of Utah Press, Salt Lake City, pp. 75–95.
Janetski, J. C., Crosland, R., and White, J. D. (1991). Preliminary report on Aspen Shelter: An upland deer hunting camp on the Old Woman Plateau. *Utah Archaeology* 4(1): 32–43.
Jenkins, D. L. (1987). Dating the Pinto occupation at Rogers Ridge: A fossil spring site in the Mojave Desert, California. *Journal of California and Great Basin Anthropology* 9: 214–231.
Jenkins, D. L., and Warren, C. N. (1984). Obsidian hydration and the Pinto chronology in the Mojave Desert. *Journal of California and Great Basin Anthropology* 6: 44–60.
Jennings, J. D. (1956). The American Southwest: A problem in cultural isolation. In Wauchope, R. (ed.), Archaeology, 1955. *Memoirs of the Society for American Archaeology* 11, Society for American Archaeology, Salt Lake City.
Jennings, J. D. (1957). Danger Cave. *University of Utah Anthropological Papers* 27, University of Utah, Salt Lake City.
Jennings, J. D. (1973). The short useful life of a simple hypothesis. *Tebiwa* 16: 1–9.
Jennings, J. D. (1980). Cowboy Cave. *University of Utah Anthropological Papers* 104, University of Utah Press, Salt Lake City.
Jennings, J. D. (1986). Prehistory: Introduction. In D'Avezedo, W. L. (ed.), Great Basin. *Handbook of North American Indians* 11, Smithsonian Institution, Washington, DC, pp. 113–119.
Jennings, J. D., Schroedl, A. R., and Holmer, R. N. (1980). Sudden Shelter. *University of Utah Anthropological Papers* 103, University of Utah Press, Salt Lake City.
Johnson, A. E. (1963). The Trincheras Culture of northern Sonora. *American Antiquity* 29: 174–186.
Johnson, A. E. (1966). Archaeology of Sonora, Mexico. In Ekholm, G., and Willey, G. (eds.), Archaeological Frontiers and External Connections. *Handbook of Middle American Indians* 4, University of Texas, Austin, pp. 26–37.
Judge, W. J. (1973). *Paleoindian Occupation of the Central Rio Grande Valley in New Mexico*, University of New Mexico Press, Albuquerque.

Kelley, J. C. (1959). The Desert Culture and the Balcones phase: Archaic manifestations in the Southwest and Texas. *American Antiquity* **24**: 276–288.
Kelly, R. L. (1983). Hunter-gatherer mobility strategies. *Journal of Anthropological Research* **39**: 277–306.
Kelly, R. L. (1992). Mobility/sedentism: Concepts, archaeological measures, and effects. *Annual Review of Anthropology* **21**: 43–66.
Kemrer, M. (1982). Archaic Period. In Kemrer, M. W. (ed.), *Archaeological Variability Within the Bisti-Star Lake Region, Northwestern New Mexico*, Bureau of Land Management, Albuquerque, pp. 16–27.
Kidder, A. V. (1924). *An Introduction to the Study of Southwestern Archaeology*, Department of Archaeology, Phillips Academy, Yale University Press, New Haven, CT.
Kidder, A. V. (1927). Southwestern archaeological conference. *Science* **66**: 489–491.
Kidder, A. V., and Guernsey, S. J. (1919). Archaeological Explorations in Northeastern Arizona. *Bureau of American Ethnology Bulletin* 65, Washington, DC.
Kutzbach, J. E. (1987). Model simulations of the climatic patterns during the deglaciation of North America. In Ruddiman, W. F. and Wright, H. E. (eds.), *North America and Adjacent Oceans During the Last Deglaciation, Vol. K-3. The Geology of North America*, The Geological Society of America, Boulder, CO, pp. 425–446.
Kutzbach, J. E., Guetter, P. J., Behling, P. J., and Selin, R. (1993). Simulated climatic changes: Results of the COHMAP climate-model experiments. In Wright, H. E., Jr., Kutzbach, J. E., Webb, T., III, Ruddiman, W. F., Street-Perrott, F. A., and Bartlein, P. J. (eds.), *Global Climates Since the Last Glacial Maximum*. University of Minnesota Press, Minneapolis, MN, pp. 24–93.
Lee, R. B. (1979). *The !Kung San: Men, Women and Work in a Foraging Society*, Cambridge University Press, Cambridge.
Le Houerou, H. N., Bingham, R. L., and Skerbek, W. (1988). Relationship between the variability of primary production and the variability of annual precipitation. *Journal of Arid Enironments* **15**: 1–18.
Lindsay, A. J., Jr., Ambler, J. R., Stein, M. A., and Hobler, P. M. (1968). Survey and Excavations North and East of Navajo Mountain, Utah, 1959-1962. *Museum of Northern Arizona Bulletin* 45, *Glen Canyon Series* 8, Northern Arizona Society of Science and Art, Flagstaff.
Lister, R. H. (1958). Archaeological Excavations in the Northern Sierra Madre Occidental, Chihuahua and Sonora. *University of Colorado Studies, Series in Anthropology* 7, University of Colorado, Boulder.
Lockett, H. C., and Hargrave, L. L. (1953). Woodchuck Cave, a Basketmaker II Site in Tsegi Canyon, Arizona. *Museum of Northern Arizona Bulletin* 26, Northern Arizona Society of Science and Art, Flagstaff.
Lowe, C. H., and Brown, D. E. (1982). Introduction. In Brown, D. E. (ed.), Biotic Communities of the American Southwest—United States and Mexico. *Desert Plants* 4(1-4): 8–16.
Lucious, W. A. (1980). Bone and shell material. In Jennings, J. D. (ed.), Cowboy Cave. *University of Utah Anthropological Papers* 104, University of Utah Press, Salt Lake City, pp. 97–107.
Lucious, W. A., and Colville, J. K. (1980). Osteological analysis of faunal remains. In Jennings, J. D., Schroedl, A. R., and Holmer, R. N. (eds.), Sudden Shelter. *University of Utah Anthropological Papers* 103, University of Utah Press, Salt Lake City, pp. 157–170.
Mabry, J. B., Swartz, D. L., Woerchl, H., Clark, J. J., Archer, G. A., and Lindeman, M. (1996) Archaeological Investigations of Early Village Sites in the Middle Santa Cruz Valley: Descriptions of the Santa Cruz Bend, Square Hearth, Stone Pipe, and Canal Sites. Center for Desert Archaeology Anthropological Papers 18, Center for Desert Archaeology, Tucson.
MacGregor, J. C. (1965). *Southwestern Archaeology*, 2nd ed., University of Illinois Press, Urbana.
MacNeish, R. S. (1964). The Food-Gathering and Incipient Agriculture Stage of Prehistoric Middle America. In West, R. C. (ed.), *Handbook of Middle American Indians, Vol. 1. Natural Environment and Early Cultures*, University of Texas, Austin, pp. 413–426.

MacNeish, R. S. (ed.) (1993). Preliminary Investigations of the Archaic in the Region of Las Cruces, New Mexico. *Historic and Natural Resources Report* 9, Cultural Resources Management Program, Directorate of the Environment, United States Army Air Defense Artillery Center, Fort Bliss, TX.

MacNeish, R. S., and Beckett, P. (1987). The Archaic Chihuahua Tradition. *Monograph* 7, COAS Bookstore, Las Cruces, NM.

MacNeish, R., and Nelken-Terner, A. (1983). The Preceramic of Mesoamerica. *Journal of Field Archaeology* **10**: 71–84.

Markgraf, V., Bradbury, J. P., Forester, R. M., Singh, G., and Sternberg, R. S. (1984). San Agustin Plains, New Mexico: Age and Paleoenvironmental Potential Reassessed. *Quaternary Research* **22**: 336–343.

Marrs, Garland J. (1949). *Problems Arising from the Surface Occurrence of Archaeological Material in Southeastern Chihuahua, Mexico.* Master's thesis, University of New Mexico, Albuquerque.

Martin, P. Schultz (1963). *The Last 10,000 Years,* University of Arizona, Tucson.

Martin, P. Sydney, and Plog, F. (1973). *The Archaeology of Arizona: A Study of the Southwest Region,* American Museum of Natural History, Garden City.

Martin, P. Sydney, Rinaldo, J. B., and Antevs, E. (1949). Cochise and Mogollon sites, Pine Lawn Valley, Western New Mexico. *Fieldiana: Anthropology* 38(1), Chicago Natural History Museum, Chicago.

Martin, P. Sydney, Rinaldo, J. B., Bluhm, E., Cutler, H. C., and Grange, R., Jr. (1952). Mogollon Cultural Continuity and Change: The Stratigraphic Analysis of Tularosa and Cordova Caves. *Fieldiana: Anthropology* 40, Chicago Natural History Museum, Chicago.

Martin, P. Sydney, Rinaldo, J. B., and Bluhm, E. (1954). Caves of the Reserve Area. *Fieldiana: Anthropology* 42, Chicago Natural History Museum, Chicago.

Matson, R. G. (1991). *The Origins of Southwestern Agriculture,* University of Arizona Press, Tucson.

Matson, R. G. (ed.) (1994a). Anasazi Origins: Recent Research on the Basketmaker II. *The Kiva* **60**(2).

Matson, R. G. (1994b). Anomalous Basketmaker II sites on Cedar Mesa: Not so anomalous after all. *The Kiva* **60**: 219–237.

Matson, R. G., and Chisholm, B. (1991). Basketmaker II subsistence: Carbon isotopes and other dietary indicators from Cedar Mesa, Utah. *American Antiquity* **56**: 444–459.

Mauldin, R. (1996). Exploring Patterns in Late Archaic and Early Ceramic Residential Occupation in the Northern Chihuahuan Desert. In Roth, B. J. (ed.), Early Formative Adaptations in the Southern Southwest. *Monographs in World Archaeology,* Prehistory Press, Madison, pp. 85–97.

McNutt, C. H., and Euler, R. C. (1966). The Red Butte lithic sites near Grand Canyon, Arizona. *American Antiquity* **31**: 410–419.

Mehringer, P. J., Jr. (1967). Pollen analysis and the alluvial chronology. *The Kiva* **32**: 96–101.

Mehringer, P. J., Jr., Martin, P. Schultz, and Haynes, C. V. (1967). Murray Springs, a mid-postglacial pollen record from southern Arizona. *American Journal of Science* **265**: 786–797.

Miksicek, C. H. (1987). Archaic plant remains from AZ BB:13:6. In Elson, M. D., and Doelle, W. H. (eds.), Archaeological Assessment of the Mission Road Extension. *Institute for American Research Technical Report* 87-6, Institute for American Research, Tucson, pp. 66–69.

Miller, J. (1980). Settlement and subsistence in the UII area. In Moore, J. L., and Winter, J. C. (eds.), *Human Adaptations to a Marginal Environment: The UII Mitigation Project,* Office of Contract Archeology, University of New Mexico, Albuquerque, pp. 437–482.

Minnis, P. E. (1985). Domesticating people and plants in the greater Southwest. In Ford, R. I. (ed.), Prehistoric Food Production in North America, *Museum of Anthropology, Anthropological Papers* 75, University of Michigan, Ann Arbor, pp. 309–339.

Minnis, P. E. (1992). Earliest plant cultivation in the desert borderlands of North America. In Cowan, C. W., and Watson, P. J. (eds.), The Origins of Agriculture, An International

Perspective. *Smithsonian Institution Series in Archaeological Inquiry,* Smithsonian Institution, Washington, DC.

Mohr, A., and Sample, L. L. (1959). San Jose sites in southeastern Utah. *El Palacio* **66**: 109–119.

Monger, H. C. (1995). Pedology in Arid Lands Archaeological Research: An Example from Southern New Mexico-Western Texas. In Pedological Perspectives in Archeological Research, *Soil Science Society of America Special Publication* 44, Madison, WI, pp. 35–50.

Moore, J. L. (1980). Archaic settlement and subsistence. In Moore, J. L., and Winter, J. C. (eds.), *Human Adaptations to a Marginal Environment: The UII Mitigation Project,* Office of Contract Archeology, University of New Mexico, Albuquerque, pp. 358–381.

Moore, J. L. (1994). Archaic Projectile Point Typology/Chronology in Northern New Mexico and the Four Corner. In Vierra, B. J. (ed.), Archaic Hunter-Gatherer Archaeology in the American Southwest. *Eastern New Mexico University Contributions in Anthropology* 13(1), Eastern New Mexico University, Portales, pp. 456–477.

Morris, E. H., and Burgh, R. F. (1954). Basket Maker II Sites near Durango, Colorado. *Carnegie Institution of Washington Publication* 604, Washington, DC.

Nusbaum, J. L. (1922). *A Basket Maker Cave in Kane County, Utah.* Indian Notes and Monographs, Museum of the American Indian, Heye Foundation, New York.

O'Connell, J. F., and Inoway, C. M. (1994). Surprise Valley projectile points and their chronological implications. *Journal of California and Great Basin Anthropology* **16**: 162–198.

O'Laughlin, T. C. (1980). The Keystone Dam Site and Other Archaic and Formative Sites in Northwest El Paso, Texas. *Publications in Anthropology* 8, El Paso Centennial Museum, University of Texas at El Paso.

Ortiz, M. R., and Taylor, F. M. (1972). Clovis fluted points from Sonora, Mexico. *The Kiva* **37**: 199–206.

Parry W., Smiley, F. E., and Burgett, G. (1994). The Archaic Occupation of Black Mesa, Arizona. In Vierra, B. J. (ed.), Archaic Hunter-Gatherer Archaeology in the American Southwest. *Eastern New Mexico University Contributions in Anthropology* 13(1), Eastern New Mexico University, Portales, pp. 185–230.

Phagan, C. J. (1988a). Projectile point analysis. I. Production of statistical types and subtypes. In Blinman, E., Phagan, C. J., and Wilshusen, R. H. (compilers), *Dolores Archaeological Program: Additive and Reductive Technologies,* United States Department of the Interior, Bureau of Reclamation, Engineering and Research Center, Denver, pp. 9–86.

Phagan, C. J. (1988b). Projectile point analysis. II. Comparison of statistical and intuitive typologies. In Blinman, E., Phagan, C. J., and Wilshusen, R. H. (eds.), *Dolores Archaeological Program: Additive and Reductive Technologies,* United States Department of the Interior, Bureau of Reclamation, Engineering and Research Center, Denver, pp. 87–177.

Phillips, D. A., Jr. (1989). Prehistory of Chihuahua and Sonora, Mexico. *Journal of World Prehistory* **3**: 373–401.

Phillips, D. A., Jr., Slaughter, M.C., and Bierer, S. B. (1993). Archaeological Studies at Kartchner Caverns State Park, Cochise County, Arizona. *SWCA Archaeological Report* 93-26, SWCA, Tucson.

Raymer, L., and Minnis, P. E. (1986). Macroplant and ethnobotanical studies. In Bayham, F. E., Morris, D. H., and Shackley, M. S. (eds.), Prehistoric Hunter-*Anthropological Field Studies* 13, Office of Cultural Resource Management, Department of Anthropology, Arizona State University, Tempe, pp. 299–314.

Reher, C. A., and Witter, D. C. (1977). Archaic settlement and vegetative diversity. In Reher, C.A. (ed.), *Settlement and Subsistence Along the Lower Chaco River, The CGP Survey,* University of New Mexico Press, Albuquerque, pp. 113–126.

Reinhart, T. R. (1967). The Rio Rancho Complex. *American Antiquity* **32**: 458–470.

Renaud, E. B. (1942). Reconnaissance Work in the Upper Rio Grande Valley, Colorado and New Mexico. *Archaeological Series* 3, University of Denver, Department of Anthropology, Denver.

Rinaldo, J. B. (1952). Specimens of stone, bone, and clay. In Martin, P. S., Rinaldo, J. B., Bluhm, E., Cutler, H. C., and Grange, R., Jr. (eds.), Mogollon Cultural Continuity and Change: The Stratigraphic Analysis of Tularosa and Cordova Caves. *Fieldiana: Anthropology* 40, Chicago Natural History Museum, Chicago, pp. 102–203.

Rinaldo, J. B. (1954). Specimens of stone, bone, and clay. In Martin, P. S., Rinaldo, J. B., and Bluhm, E. (eds.), Caves of the Reserve Area. Fieldiana: Anthropology 42, Chicago Natural History Museum, Chicago, pp. 87–158.

Roberts, F. H. H. (1935). A Folsom Complex, Preliminary Report on Investigations at the Lindenmeier Site in Northern Colorado. *Smithsonian Miscellaneous Collections* 94(4), Smithsonian Institution, Washington, DC.

Rogers, M. J. (1939). Early Lithic Industries of the Lower Basin of the Colorado River and Adjacent Desert Areas. *San Diego Museum Papers* 3, San Diego Museum of Man, San Diego.

Rogers, M. J. (1966). *Ancient Hunters of the Far West,* Union-Tribune, San Diego.

Roney, J. R. (1996). *Late Archaic cerros de trincheras in northwestern Chihuahua.* Paper presented at the 61st Annual Meeting of the Society for American Archaeology.

Roth, B. J. (1989). *Late Archaic Settlement and Subsistence in the Tucson Basin,* Ph.D. dissertation, University of Arizona, Tucson.

Roth, B. J. (1992). Sedentary agriculturalists or mobile hunter-gatherers? Evidence on the late Archaic occupation of the Tucson Basin. *The Kiva* 57: 353–370.

Roth, B. J. (ed.) (1996). Early Formative Adaptations in the Southern Southwest. *Monographs in World Archaeology* 25, Prehistory Press, Madison, WI.

Roth, B., and Huckell, B. B. (1992). Cortaro points and the Archaic of southern Arizona. *The Kiva* 57: 353–370.

Sample, L. L., and Mohr, A. (1960). Some pre-ceramic sites near Farmington, New Mexico. *The Masterkey* 34: 128–146.

Sanchez de Carpenter, G., Villalpando, C. E., and Carpenter, J. P. (1996). Proyecto La Playa: 5000 Years of Occupation in the Boquillas Valley, Sonora, Mexico. Paper presented at the 61st Annual Meeting of the Society for American Archaeology, New Orleans, LA.

Sayles, E. B. (1941). Archaeology of the Cochise Culture. *Medallion Papers* 29, Gila Pueblo, Globe, AZ, pp. 1–30.

Sayles, E. B. (1945). The San Simon Branch: Excavations at Cave Creek and in the San Simon Valley. *Medallion Papers* 34, Gila Pueblo, Globe, AZ.

Sayles, E. B. (1983). The Cochise Cultural Sequence in Southeastern Arizona. *Anthropological Papers of the University of Arizona* 42, University of Arizona, Tucson.

Sayles, E. B., and Antevs, E. (1941). The Cochise Culture. *Medallion Papers* 29, Gila Pueblo, Globe, AZ.

Schaafsma, P. (1980). *Indian Rock Art of the Southwest,* University of New Mexico Press, Albuquerque, and School of American Research, Santa Fe.

Schmader, M. F. (1996). *Archaic structures of the middle Rio Grande Valley, New Mexico.* Paper presented at the 61st Annual Meeting of the Society for American Archaeology, New Orleans.

Schmidt, R. H. (1973). A Geographical Survey of Chihuahua. *Southwestern Studies Monograph* 37, Texas Western Press, University of Texas at El Paso.

Schroedl, A. R. (1977). The Grand Canyon figurine complex. *American Antiquity* 42: 254–265.

Schroedl, A. R., and Coulam, N. J. (1994). Cowboy Cave revisited. *Utah Archaeology* 7: 1–34.

Seaman, T. J., Doleman, W. H., and Chapman, R. C. (1988). *The Border Star 85 Survey: Toward an Archeology of Landscapes,* Office of Contract Archeology, University of New Mexico, Albuquerque.

Service, E. R. (1962). *Primitive Social Organization: An Evolutionary Perspective,* Random House, New York.

Service, E. R. (1966). *The Hunters,* Prentice-Hall, Englewood Cliffs, NJ.

Shackley, M. S. (1986). Obsidian geochemistry and lithic technology: Inferences for Archaic hunter-gatherer procurement ranges. In Bayham, F. E., Morris, D. E., and Shackley, M. S. (eds.), Prehistoric Hunter-Gatherers of South Central Arizona: The Picacho Reservoir

Project. *Anthropological Field Studies* 13, Office of Cultural Resource Management, Arizona State University, Tempe, pp. 171–190.

Shackley, M. S. (1990). *Early Hunter-Gatherer Procurement Ranges and Mobility in the American Southwest: Evidence from Obsidian Geochemistry and Lithic Technology,* Ph.D. dissertation, Arizona State University, Tempe.

Shackley, M. S. (1996). Range and mobility in the early hunter-gatherer Southwest. In Roth, B. J. (ed.), Early Formative Adaptations in the Southern Southwest. *Monographs in World Archaeology* 25, Prehistory Press, Madison, WI, pp. 5–16.

Sims, J. R., and Daniel, D. S. (1967). A lithic assemblage near Winslow, Arizona. *Plateau* **39**: 175–188.

Simmons, A. H. (1986). New evidence for the early use of cultigens in the American Southwest. *American Antiquity* **51**: 73–89.

Simmons, A. H. (assembler) (1982). Prehistoric Adaptive Strategies in the Chaco Canyon Region, Northwestern New Mexico, Volume 2: Site Reports. *Navajo Nation Papers in Anthropology* 9, Navajo Nation Cultural Resource Management Program, Window Rock, AZ.

Simmons, A. H. (with Dykeman, D. D., and Hicks, P. A.) (1989). The Unknown Archeology of the Southwest: The Archaic. In Simmons, A. H., Stodder, A. L. W., Dykeman, D. D., and Hicks, P. A., Human Adaptations and Cultural Change in the Greater Southwest. *Arkansas Archeological Survey Research Series* 32, Fayetteville, pp. 39–74.

Slawson, L. V. (1987). Archaic and Hohokam Land Use in the Santa Catalina Mountains, The Excavation of the Kolb Road Site. *Southwest Cultural Series* 6, Cultural and Environmental Systems, Tucson.

Smiley, F. E. (1994). The agricultural transition in the northern Southwest: Patterns in the current chronometric data. *The Kiva* **60**: 165–189.

Smiley, F. E., and Parry, W. J. (1990). Hunter-gatherer archaeology in northeastern Arizona and southeastern Utah. In Minnis, P. E., and Redman, C. L. (eds.), *Perspectives on Southwestern Prehistory*, Westview Press, Boulder, CO, pp. 47–56.

Smiley, F. E., Parry, W. J., and Gumerman, G. J. (1986). Early Agriculture in the Black Mesa/Marsh Pass Region of Arizona: New Chronometric Data and Recent Excavations at Three Fir Shelter. Paper presented at the 51st Annual Meeting of the Society for American Archaeology, New Orleans.

Spaulding, W. G. (1991). A middle Holocene vegetation record from the Mojave Desert of North America and its paleoclimatic significance. *Quaternary Research* **35**: 427–437.

Speth, J. D., and Scott, S. L. (1989). Horticulture and large mammal hunting: The role of resource depletion and the constraints of time and labor. In Kent, S. (ed.), *Farmers as Hunters: The Implications of Sedentism*. Cambridge University Press, Cambridge, pp. 71–79.

Steward, J. H. (1936). The economic and social basis of primitive bands. In Lowie, R. H. (ed.), *Essays in Anthropology Presented to A. L. Kroeber in Celebration of His Sixtieth Birthday,* University of California Press, Berkeley, pp. 331–350.

Steward, J. H. (1938). Basin-Plateau Aboriginal Sociopolitical Groups. *Bureau of American Ethnology Bulletin* 120, Smithsonian Institution, Washington, DC.

Steward, J. H. (1955). *Theory of Culture Change: The Methodology of Multilinear Evolution,* University of Illinois Press, Urbana.

Szuter, C. R. (1986). Archaic period taxonomic richness and animal utilization at La Paloma. In Dart, A. (ed.), Archaeological Investigations at La Paloma: Archaic and Hohokam Occupations at Three Sites in the Northeastern Tucson Basin, Arizona. *Institute for American Research Anthropological Papers* 4. Institute for American Research, Tucson, pp. 155–165.

Szuter, C. R., and Bayham, F. E. (1989). Sedentism and animal procurement among desert horticulturalists of the North American Southwest. In Kent, S. (ed.), *Farmers as Hunters: The Implications of Sedentism.* Cambridge University Press, Cambridge, pp. 80–95.

Szuter, C. R., and Bayham, F. E. (1996). Faunal exploitation during the Late Archaic and Early Ceramic/Pioneer periods in south-central Arizona. In Roth, B. J. (ed.), Early

Formative Adaptations in the Southern Southwest. *Monographs in World Archaeology* 25, Prehistory Press, Madison, WI, pp. 65–72.

Tagg, M. D. (1994). Projectile points of east-central Arizona: Forms and chronology. In Jones, A. T., and Tagg, M. D. (eds.), Middle Little Colorado River Archaeology: From the Parks to the People. *The Arizona Archaeologist* 27, Arizona Archaeological Society, Phoenix, pp. 87-115.

Thiel, J. H. (1995). *Rock Art in Arizona*, Arizona State Historic Preservation Office, Phoenix.

Thomas, D. H. (1981). How to classify the projectile points from Monitor Valley, Nevada. *Journal of California and Great Basin Anthropology* 3: 215–234.

Thompson, R. S., Whitlock, C., Bartlein, P. J., Harrison, S. P., and Spaulding, W. G. (1993). Climatic Changes in the Western United States since 18,000 yr. B.P. In Wright, H. E., Kutzbach, J. E., Street-Perrott, F. A., and Bartlein, P. J. (eds.), *Global Climates Since the Last Glacial Maximum*, University of Minnesota Press, Minneapolis, pp. 468–513.

Toll, M. S., and Cully, A. C. (1994). Archaic subsistence and seasonal population flow in northwest New Mexico. In Vierra, B.J. (ed.), Archaic Hunter-Gatherer Archaeology in the American Southwest. *Eastern New Mexico University Contributions in Anthropology* 13(1), Eastern New Mexico University, Portales, pp. 103–120.

Upham, S., MacNeish, R. S., Galinat, W., and Stevenson, C. (1987). Evidence concerning the origin of Maiz de Ocho. *American Anthropologist* **89**: 410–419.

Van Devender, T. R. (1977). Holocene Woodlands in the Southwestern Deserts. *Science* **198**: 189–192.

Van Devender, T. R. (1990a). Late quaternary vegetation and climate of the Sonoran Desert, United States and Mexico. In Betancourt, J. L., Van Devender, T. R., and Martin, P. S. (eds)., *Packrat Middens*, University of Arizona Press, Tucson, pp. 134–165.

Van Devender, T. R. (1990b). Late quaternary vegetation and climate of the Chihuahuan Desert, United States and Mexico. In Betancourt, J. L., Van Devender, T. R., and Martin, P. S. (eds)., *Packrat Middens*. University of Arizona Press, Tucson, pp. 134–165.

Vaughn, S. J., and Warren, C. N. (1987). Toward a definition of Pinto points. *Journal of California and Great Basin Anthropology* 9(2): 199–213.

Vierra, B. J. (1980). A preliminary ethnographic model of the Southwestern Archaic settlement system. In Moore, J. L., and Winter, J. C. (eds.), *Human Adaptations in a Marginal Environment: The UII Mitigation Project*, Office of Contract Archeology, University of New Mexico, Albuquerque, pp. 351-357.

Vierra, B. J. (1990). Archaic hunter-gatherer archaeology in northwestern New Mexico. In Minnis, P. E., and Redman, C. L. (eds.), *Perspectives on Southwestern Prehistory*, Westview Press, Boulder, CO, pp. 57–67.

Vierra, B. J. (ed.) (1994a). Archaic Hunter-Gatherer Archaeology in the American Southwest. *Eastern New Mexico University Contributions in Anthropology* 13(1), Eastern New Mexico University, Portales.

Vierra, B. J. (1994b). Archaic hunter-gatherer mobility strategies in northwestern New Mexico. In Vierra, B.J. (ed.), Archaic Hunter-Gatherer Archaeology in the American Southwest. *Eastern New Mexico University Contributions in Anthropology* 13(1), Eastern New Mexico University, Portales, pp. 121–154.

Vierra, B. J., and Doleman, W. H. (1994). The organization of Archaic settlement-subsistence systems in the northern Southwest. In Vierra, B. J. (ed.), Archaic Hunter-Gatherer Archaeology in the American Southwest. *Eastern New Mexico University Contributions in Anthropology* 13(1), Eastern New Mexico University, Portales, pp. 76–102.

Vogler, L. E., Gilpin, D., and Anderson, J. K. (1983). Cultural Resource Investigations on Gallegos Mesa: Excavations in Blocks VIII and IX, and Testing Operations in Blocks X and XI, Navajo Indian Irrigation Project, San Juan County, New Mexico. *Navajo Nation Papers in Anthropology* 24, Navajo Nation Cultural Resource Management Program, Window Rock, AZ.

Vogler, L. E., Langenfeld, K., and Gilpin, D. (1993). DAA'AK'EH NITSAA: An Overview of the Cultural Resources of the Navajo Indian Irrigation Project, Northwestern New Mexico. *Navajo Nation Papers in Anthropology* 29, Navajo Nation Archaeology Department, Window Rock, AZ.

Wait, W. K. (1976). *An Archaeological Survey of Star Lake: A Report on the Prehistoric, Historic, and Current Cultural Resources of the Star Lake Area, McKinley County, Northwestern New Mexico,* Southern Illinois University Press, Carbondale.

Wait, W. K. (1983). A preliminary model for the preceramic at Star Lake. In Wait, W. K., and Nelson, B. (eds.), The Star Lake Archaeological Project,. Southern Illinois University Press, Carbondale, pp. 131–152.

Wandsnider, L., and Ebert, J. I. (eds.) (1988). Issues in Archaeological Surface Survey: Meshing Method and Theory. *American Archaeology* 7(1).

Warren, C. N. (1967). The San Dieguito complex: A review and hypothesis. *American Antiquity* **32**: 168–186.

Warren, C. N. (1980). Pinto points and problems in Mojave Desert archeology. In Harten, L. B., Warren, C. N., and Touhy, D. R., *Anthropological Papers in Memory of Earl H. Swanson, Jr.*. Special Publication of the Idaho Museum of Natural History, Pocatello, pp. 67–76.

Warren, C. N. (1984). The desert region. In Moratto, M. J. (ed.), *California Archaeology,* Academic Press, Orlando, FL, pp. 339–430.

Warren, C. N., and Crabtree, R. H. (1986). Prehistory of the southwestern area. In D'Azevedo, W. L. (ed.), Great Basin. *Handbook of North American Indians* 11, Smithsonian Institution, Washington, DC, pp. 183–193.

Waters, M. R. (1986a). The Geoarchaeology of Whitewater Draw, Arizona. *Anthropological Papers of the University of Arizona* 45, University of Arizona Press, Tucson.

Waters, M. R. (1986b). The Sulphur Spring stage and its place in New World prehistory. *Quaternary Research* **25**: 251–256.

Waters, M. R. (1988). The geoarchaeology of gullies and arroyos in southern Arizona. *Journal of Field Archaeology* **18**: 141–159.

Waters, M. R. (1989). Late Quaternary lacustrine history and paleoclimatic significance of pluvial Lake Cochise, southeastern Arizona. *Quaternary Research* **32**: 1–11.

Waters, M. R., and Woosley, A. I. (1990). The geoarchaeology and preceramic prehistory of the Willcox Basin, SE Arizona. *Journal of Field Archaeology* **17**: 163–175.

Wendorf, F., and Miller, J. P. (1959). Artifacts from high mountain sites in the Sangre de Cristo Range, New Mexico. *El Palacio* 37–52.

Wendorf, F., and Thomas, T. H. (1951). Early man sites near Concho, Arizona. *American Antiquity* **17**(2): 107–114.

Whalen, M. E. (1994). Moving out of the Archaic on the edge of the Southwest. *American Antiquity* **59**: 622–638.

Whalen, N. M. (1971). *Cochise Culture Sites in the Central San Pedro Drainage, Arizona*. Ph.D. dissertation, University of Arizona, Tucson.

Whalen, N. M. (1975). Cochise site distribution in the San Pedro Valley. *The Kiva* **40**: 203–211.

Wiens, R. W. (1994). The early Archaic in northwestern New Mexico: A re-evaluation based on data from Gallegos Mesa. In Vierra, B.J. (ed.), Archaic Hunter-Gatherer Archaeology in the American Southwest. *Eastern New Mexico University Contributions in Anthropology* 13(1), Eastern New Mexico University, Portales, pp. 62–75.

Wilde, J. D., and Newman, D. E. (1989). Late Archaic corn in the eastern Great Basin. *American Anthropologist* **91**: 712–720.

Willey, G. R. (1966). *An Introduction to American Archaeology, Vol. I. North and Middle America,* Prentice-Hall, Englewood Cliffs, NJ.

Willey, G. R., and Phillips, P. (1958). *Method and Theory in American Archaeology,* University of Chicago Press, Chicago.

Wills, W. H. (1988a). *Early Prehistoric Agriculture in the American Southwest,* School of American Research Press, Santa Fe.

Wills, W. H. (1988b). Early agriculture and sedentism in the American Southwest: Evidence and interpretations. *Journal of World Prehistory* **2**: 445–488.

Wills, W. H. (1990). Cultivating ideas: The changing intellectual history of the introduction of agriculture in the American Southwest. In Minnis, P. E., and Redman, C. L. (eds.), *Perspectives on Southwestern Prehistory,* Westview Press, Boulder, CO, pp. 319–331.

Wills, W. H. (1992). Plant cultivation and the evolution of risk-prone economies in the prehistoric American Southwest. In Gebauer, A. B., and Price, T. D. (eds.), Transitions to Agriculture in Prehistory. *Monographs in World Archaeology* 4, Prehistory Press, Madison, pp. 153–176.

Wills, W. H. (1995). Archaic foraging and the beginning of food production in the American Southwest. In Price, T. D., and Gebauer, A. B. (eds.), *Last Hunters, First Farmers,* School of American Research, Santa Fe, pp. 215–242.

Wills, W. H., and Huckell, B. B. (1994). Economic implications of changing land-use patterns in the Late Archaic. In Gumerman, G. J. (ed.), Themes in Southwest Prehistory, *School of American Research Advanced Seminar Series*, School of American Research, Santa Fe, pp. 33–52.

Windmiller, R. (1973). The late Cochise Culture in the Sulphur Spring Valley, southeastern Arizona: Archaeology of the Fairchild Site. *The Kiva* 39: 131–169.

Windmiller, R., and Huckell, B. B. (1973). Desert culture sites near Mormon Lake, northern Arizona. *The Kiva* 39: 199–211.

Wiseman, R. N. (1993). Tentative chronological framework of Paleo-Indian and Archaic projectile points in Lincoln County, south-central New Mexico. *The Artifact* 31: 45–57.

Woodbury, R. B. (1993). *60 Years of Southwestern Archaeology, a History of the Pecos Conference,* University of New Mexico Press, Albuquerque.

Yellen, J. E. (1977). *Archaeological Approaches to the Present,* Academic Press, New York.